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BIOACCUMULATION OF SOME HEAVY METALS IN TWO TYPE OF AQUATIC PLANT IN EUPHRATES RIVER IN THI- QAR PROVINCE, SOUTHERN OF IRAQ

Afaq T. Farhood*

Analysis Pathological Department –Science Collage-Thi-Qar University.

***Corresponding Author: Afaq T. Farhood**

Analysis Pathological Department -Science Collage-Thi-Qar University.

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ABSTRACT

The present study was conducted during and summer of 2016 to study the bioaccumulation of some heavy metalsin two type of aquatic plants (*Ceratophyllum demersum, Phragmites australis*) and the use it as bioindicator to the accumulation of these elements through (water - aquatic plant) at two stations in Euphrates river in Thi- Qar province, Southern of Iraq. Three heavy elements (Cd, Cu, Pb) were used in this study. The elements were studied in the dissolved of water and aquatic plant (*C. demersum, P. australis*), the bioconcentration factor B C. F was calculated for the above studied elements in the aquatic plant tissue, which was as follows: (Cd (25000-16667), Cu (2857- 1786) and Pb (35417- 29167) once as concentrated in water respectively. The study concluded that the concentrations of the studied elements in the plants tissue are higher than in the water with dissolved phase, *C. demersum* accumulate all metals more than *P.australis,*. The abundance of elements is as follows: pb > Cu> Cd. This plant have a great ability to accumulate heavy elements and considered a good biological indicators for this type of pollutants.

KEYWORDS: Heavy metals, Water, *C. demersum, P.australis*, biococentration.

INTRODUCTION

Water is an essential natural resource for human life. Furthermore, it is an important resource in developing economics and society in terms of agriculture, industry and various facilities. Rivers not only supply water for human consumption but also receive wastewaters discharged from all human activities (ICMM, 2007).

All Aquatic ecosystems in the world are under increasing stress due to the effects of the rapidly growing population, technological development, urbanization and economic growth. Human activities are causing aquatic species to disappear at an alarming rate (Viessman & Hammer, 1985).

The internal water in Iraq covers about (24000) km² which consist more than (5%) of Iraq area including, marshes, lakes, Tigris, Euphrates, their tributaries and branches (Jerry & Webb, 2004).

To the various types of pollutants from various sources, including sewage and wrong style flows in the waste and recycling treatment, including the remnants of war (UNEP, 2003) and negligence in the maintenance of laboratories and factories and monitor the implementation of environmental safety requirements. Among these organic and inorganic chemicals pollutant, which cause danger directly on the lives of most aquatic and human alike, by entering the food chain and accumulate in the levels of that chain and aquatic wildlife (FAO, 1994).

Bioaccumulation is the capacity of a substance to build up in the tissues of organisms either through direct exposure to water, air, and soil or through consumption of food. (Jerry & Webb, 2004).

The present study aimed to determine variations in the distribution and concentration of some heavy metals in two aquatic plants (*C. demersum, P.australis*) collected from Euphrates river in Thi- Qar province, and from which they can determine the levels of these elements in the study area.

MATERIAL AND METHOD

Study of stations

The completion of the current study was chosen two stations (Figure 1) as follows:

1. **The First Station**: Chosen at two sites in the **Euphrates River** in where of location (1) before entering the river the center of Al- Nassyria city.
2. **The Second Station**: site after the exit of the river from the center of the city (site is about 5 km away from the first stations), and took the rate of this stations.

Water, aquatic plant *(C. demersum, P. australis)* collected from Euphrates River (Fig -1) during summer /

2016. Water samples were collected using plastic bottles (polyethylene) with capacity of 5 liters per sample, these samples have been suction filtered through prewashed reweighed 0.45um Millipore membrane filters. Materials passing through the filters were considered as dissolved. The analysis of dissolved Trace metals were achieved according to procedure of (Riely and Taylor, 1968.)

The fresh ends were taken by hand and washed with river water then placed in plastic bags, transported to the laboratory in a cooler box and placed in the freezer until analysis. The non-rooted-submerged hornwort aquatic plants *(C. demersum*, *P. australis*), The washed and cleaned fresh ends of the aquatic plant, were acid digested according to (US-EPA, 1991) method. Heavy metals were extracted in triplicate from Water, Aquatic plants samples. Cd, Cu, and, Pb were determined in air /acetylene flam Atomic absorption spectrophotometer AAS –Model Shimadzu 6300. Blank values negligible for all studied metals –Acid used were ultrapure and water was deionized.

The bioconcentration factor was calculated according to the following equation: (Demina *et al.* 2009)

$$B.C.F = \frac{\text{Conc. of element in plant}}{\text{Conc. of element in water}}$$

Figure (1): aquatic plant (*C. demeresum*)

Figure (2): aquatic plant (*P.australis*)

Statistical Analysis: Analysis of Variance ANOVA test were done to know the Least significant difference between aquatic plants types using Minitab program.

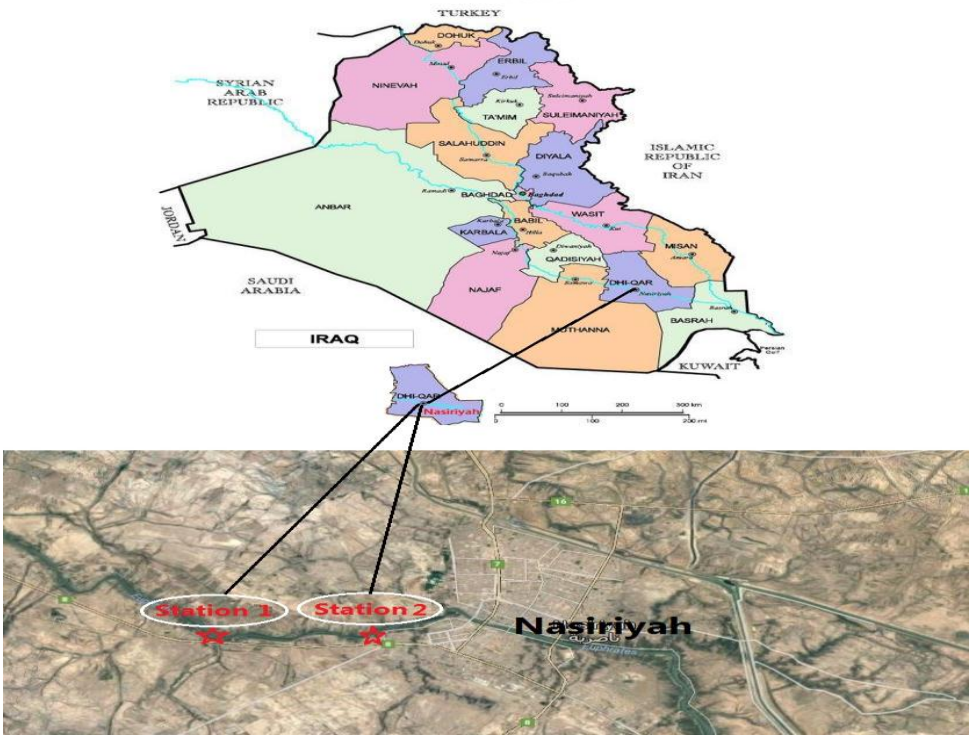

Figure 1: Map of the study area showed the study stations.

RESULT AND DISCUSSION

Three of Heavy metals (Cd, Cu, and Pb) has been discussed in the present study. The measured of these pollutants in the studied water, aquatic plants (*C. demeresum, P. australis*).

The mean concentration of the mentioned in dissolved phase at the study station (1 and 2) was as follow; Cd (0.15, 0.09), Cu (1.6, 1.2); and; Pb (0.3, 0.18) ug /L respectively, where as their concentration in the aquatic plants (*C. demeresum, P.australis*) was; Cd (3, 2), Cu (4, 2.5); and Pb (8.5, 7) ug / gm dry weight respectivelyshown in Table (1, 2).

Metals concentration in station (1) were higher than their concentration in station (2), this may be due to the exposure of station (1) to the various types of pollutants such as sewage, oil spill from boats, animal, wastes and chemical used in fishing, because this station was located close to the residential area (Al-Khafaji *et.al*; 2012), shown in Table (1).

Statistical analysis showed significant difference ($p < 0.05$) between stations at water were apparent at the level of $P < 0.05$.

Table 1: Heavy metals concentration rang and Mean ± SD in water (dissolve (ug / L), mean conc. In the region.

Metals	Station 1	Station 2	Mean con. In the region of study
Cd	(0.1-0.18) 0.15 $\pm$0.07	(0.05-0.1) 0.09 $\pm$0.02	0.12 $\pm$ 0.045
Cu	(1.5-2) 1.6 $\pm$ 0.8	(1-1.6) 1.2$\pm$ 0.6	1.4 $\pm$ 0.7
Pb	(0.25-0.38) 0.3 $\pm$ 0.02	(0.12 - 0.22) 0.18 $\pm$ 0.7	0.24 $\pm$ 0.06

Heavy metals as higher as 10^6 times than their levels in the surrounding water also the concentration of trace metals in aquatic environment depends on many factors such as water discharge of the river, seasonal variations in quantitive and qualitative of plank ton and suspended material load of river (Nolting,1986). The results of this study agree with many previous studies (Qzar, 2009; Al-Abadi, 2011; Al-Awady, 2012, Mashkhool, 2012).

Aquatic plant as a part of the an aquatic ecosystem, Aquatic plant accumulate certain heavy metals from the ambient environment and many be used as bio indicators of pollution by these type of pollutants (Al-Khafaji, 2005; Al-Nagar, 2009 and Al-Awady 2012).

The present study showed that the different aquatic plant were varied from one to another in their accumulation of heavy metals shown in (Table2, 3).

Aquatic plant accumulated heavy metals from their environment, they are excellent organism for the study of some long – term changes of heavy metals in the environment (Radeef *et. at*; 2013).

Statistical analysis showed not significant difference ($p < 0.05$) between at aquatic plant s were apparent at the level of $P < 0.05$ also, positive significant correlation between concentration all heavy metals in water and it concentration in aquatic plant.

C. demeresum, concentrated metals more than at *P. australis*, The rate of bio concentration for Cd (25000, 16667), Cu (2857, 1786), and pb (35417, 29167) respectively, shown in Table (3).

Table 3: Bioconcentration rang of heavy metals in Aquatic plants.

Metals	Water	*C. demersum* X1000	*P.australis* X1000	*Bioconcentration of C. demersum*	*Bioconcentration P.australis*
Cd	0.12	3000	2000	25000	16667
Cu	1.4	4000	2500	2857	1786
Pb	0.24	8500	7000	35417	29167

The present study showed that the concentration of the studied metals in water, *C. demeresum* and *P.australis* are as follows or the over all order of enrichment for heavy metals in different for both species of plant were in water: Cu> pb > Cd, while in Aquatic plant *C. demeresum, P. australis*: pb > Cu > Cd, shown in Table (2).

The conclusion: The concentration of metals aquatic plant were very higher than in water, also, The concentration of metals in *C. demeresum* higher than, *P. australis*, which promote the have mentored phenomenon (Windom *et. al*; 1973) indicated that difference in metals accumulation in Aquatic plant may be due to the difference in their during the growth of the species, and can us considered the aquatic plant in this study good a bio indicator for this type of pollutant.

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