Measurement the Heavy Elements of *Phragmites australis* and *Syllibium marianum* in Hor Al- Dalmaj, Southern Iraq

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Abstract

An environmental study was conducted in Hor Al-Dalmaj in order to determine some heavy metals in two plant species. The study period started from summer 2019 to winter 2020 included measuring the concentration of three heavy elements, (lead, cadmium and copper) for two types of aquatic plants (*Phragmites australis* and *Syllibium marianum*), for two seasons summer and winter. The results of measurement of the concentration of heavy elements are shown, the highest average concentration of elemental Lead was 63.51 ppm in the reed plant *Phragmites australis* during the winter season. For Cadmium concentrations, the highest concentration in plants was 0.434 ppm in thistle *Syllibium marianum* samples during the winter season. The concentration of the copper element in the plant samples reached the highest significant concentration of 20.84 ppm in the reed plant *Phragmites australis* during the summer. The element concentrations in the models were estimated with the English made Flame Atomic Absorption Spectrometry Buck 210 VGP. The result and levels obtained from the study were higher than the cheeks allowed by the world health organization (WHO) for drinking water.

Introduction

Heavy elements are the elements that have a density higher than 5 g / cm³ and are found in very low concentrations in living systems and are of high stability (Neis, 1999). Heavy metals play an important function in the life of living things and their different biological activities, even if they are in low concentrations, (Markert and Oehlmann, 1998). From an environmental point of view, heavy elements, when available and accumulated, may have a toxic and inhibitory effect on living organisms (Forester and Wase, 1997). Pollution of the water environment with heavy elements results from its natural sources in the environment and from various human activities (Behra et al., 2002). The distribution of heavy metals and seasonal differences in the re-flooded marshes in southern Iraq were studied and studied (AlMaarofi et al., 2013) and showed that the distribution of heavy metals in Al-Huwaizah and Hammar marshes was effective in reducing minerals, (DouAbul et al., 2013). What excess the risk of heavy elements in the environment is the disability to demolish them by bacteria and other natural processes, as well as their constancy that enables them to diffusion far distances from their sources, and perhaps the most dangerous thing in them is due to the capability of some of them to bio-accumulation in the tissues and organs of living things (Al Saadi, 2002).
Materials and Methods
Description of the study area and stations

The study area, illustrated in Figure (1), located between Wasit and Diwaniyah governorates, is a wet swamp area, and its water is stagnant or slowflowing, and some strategic crops such as wheat, barley, corn and sunflower are grown in it, as the source of irrigation is the third river, which is water Salty, as it includes many natural plants that grow in abundance, such as reeds, golan, shimplan, homera and sedge, and the region also has a weight in raising buffaloes, so it has economic importance as buffaloes are released there without supervision, in order to graze on the grass that is there, and there are many breeders Camels and their flocks are there in the areas surrounding the colossal

![Figure (1): Shows the study area.](image)

Collecting plant samples

The leaves of the studied plant leaves (*Phragmites australis* and *Syllibium marianum*) were collected, washed with tap water, then wrapped with aluminum foil and labeled the samples. Samples were dried at a temperature of 15 C and then homogenized, then preserved with marked aluminum foil and stored at -20 C until extraction and analysis (Kipopoulouet *et al.*, 1999).

Extraction of plant samples

Extraction was according to the method (Grimalt and Oliver, 1993). (Figure 2).
Heavy metals measurement
Conducting the measurement of the proportions of heavy elements in plants, taking the necessary steps for measurement with the Flame Atomic Absorption Spectrophotometer, depending on (Haswell, 1991), as follows:

1. A quantity of pre-prepared samples was taken and placed in a watch bottle in an electric oven at 105 °C until dehydration.
2. Two gm of the dry form was taken in glass beakers, and 40 ml of concentrated nitric acid HNO3 (70%) was added to it to carry out the digestion process and left the form covered with an hour bottle for a day.
3. The sample was heated using a hotplate at a temperature of 60 °C until the sample was melted.
4. After letting the model cool down, 3 ml of pyrochloric acid HClO4 (60%) was added and the heating process was repeated at a low temperature of 40 °C until it dried.
5. The sample was lifted from the hot plate and then it was cooled. 3 ml of HCl and 3 ml of distilled water were added to it and returned to the preheater at a low temperature for the purpose of dissolving the sediments.
6. Whatman 0.45 filter paper was filtered and the resulting solution was placed in a 50 mL glass volumetric flask and complete the volume with distilled water to the mark.
7. The Blank reference solutions were prepared in the same way, without using a sample.
8. Standard element solutions are dispensed by Fluka.
9. The element concentrations in the models were estimated with the English made Flame Atomic Absorption Spectrometry Buck 210 VGP.

Results and discussion
Concentration of heavy elements in environmental models

Lead concentration Pb (ppm)

Some studies indicated that aquatic plants assemble heavy metals in their tissues, and thus they has been used as biological index to observe mineral pollutants in the aquatic ecosystem. Figure (2) shows the concentrations of the element lead in plant samples within Al-Dalmaj marsh during the summer and winter seasons, and it is noticed that the highest concentration is it was recorded in the reed plant Phragmites australis during the winter season, when it reached 63.51 ppm, with a significant difference from the rest of the averages, while the lowest averages were 0.014 ppm in samples of thistle Syllibium marianum during the summer.
Figure (2): Measurement of lead concentrations in plant samples during summer and winter seasons (ppm).

The values attend by the identical letter dont diverge significantly from each other according to the Duncan Multiple-Range-Test (Pr≤0.05).

Cadmium Concentration Cd (ppm)

Figure (3) shows the cadmium element concentrations in samples from the Mar-Delmaj plants during the summer and winter seasons, as it was found that the highest concentration was recorded at 0.434 ppm in thistle Syllibium marianum samples during the winter, with a significant difference from other averages, while Phragmites australis was recorded during the season. Summer is the lowest concentration of 0.012 ppm.

The reason for plant absorption of cadmium ion may be what he mentioned (Lasat, 2000) that plants have a natural characteristic of taking some minerals such as copper, cobalt, iron, molybdenum, nickel and zinc as essential nutrients and some of them, such as cadmium and lead, have no known physiological efficacy.

Figure (3): Means of cadmium concentrations in plant samples during summer and winter seasons (ppm).
The values attend by the identical letter dont diverge significantly from each other according to the Duncan Multiple-Range-Test ($Pr\leq0.05$).

**Copper Concentration Cu (ppm)**

The plant tissues are ideal factors in reflecting the picture of pollution more than they are in water due to the processes of adsorption and absorption (Memon et al., 2001). The accumulation of heavy elements in plant tissues Bioaccumulation varies according to the difference in the plant type, the parameter properties of water and soil, the specificity of absorption and transfer of elements, as well as the difference in the physiological, chemical and molecular mechanism of the accumulation process (Prasad, 1998).

Figure (4) showed the results of the detection of copper element in the plant samples of Al-Dalmaj marsh during the summer and winter seasons, among which it was found that the reed plant *Phragmites australis* during the summer recorded the highest significant concentration with an average of 20.84 ppm, while the lowest concentration was 3.54 ppm in the samples of *Sylibium marianum* during summer season.

When comparing the current results with the results of some studies, we find that in *Typha domingensis*, the highest concentration of copper was 1.7 ppm (Algom, 2002) and 28.29 ppm (Salman, 2006), and in *Ceratophyllum demersum*, the element concentration was 13.92 ppm (Al-Taie, 1999), and *Phragmites australis* was 28.29 ppm (Salman, 2006). In the study of Hassan et al. (2005), it was mentioned that the reed plant may accumulate heavy elements in the leaves more than in the roots. The reason for the high concentrations of elements in this study may be due to their high concentrations in the water of the studied area compared to other areas, or to the ability of the studied plants to concentrate the elements in their tissues more than other plants. Awad et al (2008) when measuring the concentrations of heavy metals in both *P. Crispus*, *P. Nodosus*, *Ceratophyllum demersum*, *Salvinia natans*, *Potamogeton pectinatans*, *Salicornia herbacea* and *Vallisneria spiralis* in Al-Hawizah and Al-Hammar marshs that copper element concentrations ranged between 0.77-2.5 ppm in Al-Hawizah and 0.72-3.5 ppm in Al-Hamizah and 0.72-3.5 ppm in Al-Hamizah.
Figure (4): Means of copper concentrations in plant samples during summer and winter seasons (ppm).

The values attend by the identical letter dont diverge significantly from each other according to the Duncan Multiple Range Test (Pr≤0.05).

Conclusions

The results of detection of heavy elements gave significant concentrations in some samples. The results obtained from this study in its current form indicate an improvement in the quality of the marsh water compared to other studies despite the deviation of some values from the normal levels. The causes of pollution are due to the population groups and different agricultural practices. The result and levels obtained from the study were higher than the checks allowed by the world health organization (WHO) for drinking water.

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