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THE USE OF PLANT *HELIANTHUS ANNUUS* AS ACCUMULATORS OF HEAVY ELEMENTS IN SOME SOILS

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Abstract

This study was conducted in Al-Qadisiyah governorate to determine the ability of *Helianthus annuus* plant to withdraw and accumulate heavy metals cadmium, chromium, lead and copper to reduce soil pollution.

The study included estimating the concentration of the elements in (12) soil samples in addition to soil control. The samples were analyzed for the concentration of certain heavy metals such as cadmium, chromium, lead and copper, it turns out that the highest value of cadmium was 18.8 mg/g dry weight in sample (3) and lowest 11.5mg / g dry weight in sample 13 and chromium element (41.2 mg / g) dry weight in sample number (3) and the lowest value was 12.3mg / g dry weight in sample No. (13). For the lead element, the highest value was 25.9mg / g dry weight in sample No. (11) and lowest value in sample No. (13) was 5.22mg / g. The highest copper value was 37.8mg / g dry weight in sample (3) and the lowest value was 12.9mg / g dry weight in sample No. (13) indicating that these elements are absorbed by the studied plant which showed results in the absorption efficiency of the studied elements.

Key words : Cadmium, lead, soil pollution, *Helianthus annuus.*

Introduction

Environmental pollution of heavy elements has become an important problem worldwide in recent years because most of them have toxic effects on organisms (Duruibe *et al*., 2007). Some are harmful even in low concentrations and represent dangerous environmental contaminants because they are not biodegradable, thus it remain stuck or partially dissolved in the water column. It enters the organism's body through food, air, or contaminated water and accumulates over time, causing various damage to the organism. Human and animal needs a specific proportion of these elements, some of which may be obtained in the plant through the food chain (Blanco, 2005). The heavy elements in the soil are found naturally and in varying concentrations from one environment to another as a result of several environmental factors, the extraction of ore from the mines, the preparation and use of elements and their compounds in the industry, the use of chemical fertilizers, pesticides, chemical plants, household waste and the effects of rain to the environment (Fernandez-Leborans *et al*., 2000).

Heavy metals such as (cadmium, lead, chromium, copper, etc) are a serious problem for the tendency of these compounds to accumulate and concentrate within living ecosystems. They have reached a high level of risk, leaving a great burden on the environment and the human considered to be part of this environmental burden.

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), sulfur (cadmium sulphide, cadmium sulfide).

All soil and rock, including coal and mineral fertilizers, contain some cadmium. Cadmium leaks into the soil, water and air from mining, industry, burnt coal and household wastes. Cadmium does not decompose into the environment but can change its shape. Cadmium is strongly linked to soil and it absorbed by plants.

Lead is an important element of pollution and its sources are mining, melting and Smoothing, the manufacture of batteries, dyes, combustion of fuel,

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pesticides and burning of gasoline (Gbaruko *et al*., 2007). Lead causes headaches and general weakness as well as increases the secretion of uric acid and its accumulation in the joints and kidneys, and reduces the formation of hemoglobin in the body also replaces calcium in the tissues of bone and cause mental retardation in children, and accumulation in the fetus leads to fetal deformation and abortion of pregnant women. For all these reasons, the importance of this field research to estimate the lead element in the air of Hilla city and to indicate the areas of contamination of this element.

There are a lot of studies that confirmed the role of plants as vital agents for pollution of heavy elements. Spiegel (2002) pointed out that aquatic plants absorb heavy elements such as iron, copper, alnicol, molybdium and cadmium for the purpose of growth and development. Plants also build up some toxic elements (silver and cadmium) Chromium, cobalt, lead, mercury and selenium), which have no obvious significance in the plant.

Alariani (2005) concluded that the sun flower plant *Helianthus annuus* has the potential to grow in soil containing toxic concentrations of lead, cadmium, copper, chromium, nickel and zinc, and its accumulation in the root total is higher than the stem and leaf. *Phragmites australis* can capture elements of lead, cadmium, copper and zinc in its leaves, as Antonjeric and Maric (2008) have shown that plant species *Eichhorina crassipes*, *Lemmna* sp., *Scirpus* sp., *Typhasp* and *Myriophyllum* sp. have the ability to remove toxic elements (chromium, lead, cadmium, chromium, nickel and zinc) from the surrounding environment. This ability depends on the geochemistry of the precipitant from which the plant absorbs the trace element by the roots and the chemical water properties and the physiological and genetic characteristics of the plant (Aksorm and Nisoottiriseth, 2004). Salih (2001) studied the bioaccumulation of some heavy metals (Cu, Co, Cu, Cr, Fe, Mn, Ni, Pb, Zn) in leaves of the aquatic plant *Ruppia maritime* and found that this plant has the ability to accumulate these elements.

Materials and Methods

The samples were collected and washed with free of ions distilled water (all plants). The samples were dried at 70ºC for 48 hours. After dry samples were grated, the samples were passed through a 40 mesh sieve. After that, 0.5g of sample was taken and placed in a perix digestion tube and 5ml of concentrated nitric acid were added, then left for 16hours and then digested at 100ºC for one hour. About 3 ml of 70% bacuric acid were added and reflux for 30 minutes at 200ºC until the solution becomes clear after the disposal of any existing polutants with the centrifugation of the samples for 10 min. at2000 rpm. After that, the volume was completed to 50ml using ion-free water and placed in special plastic cups for the purpose of testing with the Flame Atomic Absorption Spectrophotometer with a unit of µg/ g (Antonjeric and Maric, 2008).

Results and Discussion

The results showed that the highest value of cadmium was 18.8mg/g dry weight in sample (3) and lowest (11.5mg/g) dry weight in sample 13, and the highest concentration of chromium (41.2mg / g) dry weight in sample (3) and the lowest value of 12.3 mg / g dry weight in sample No. (13), while the lead element was the highest value (25.9 mg / g) dry weight in the sample No. (11) and the lowest value in sample No. (13) where it reached 5.22 mg / g dry weight, and the highest value of copper

Table 1 : Contents of the study samples of heavy elements (cadmium - chromium - lead - copper).

Sample	Cd concentration mg/g dry weight	Cr concentration mg/g dry weight	Pb concentration mg/g dry weight	CU concentration mg/g dry weight
1	15.7	32.3	20.9	34.2
2	14.3	22.7	20.7	26.9
3	18.8	41.2	23.9	37.8
4	16.8	37.1	22.7	33.9
5	15.2	31.7	21.3	29.3
6	15.7	30.1	22.8	30.7
7	13.2	21.9	18.7	21.5
8	14.63	29.6	20.2	27.1
9	13.3	22.3	19.3	22.37
10	16.1	36.7	21.9	31.2
11	18.7	40.3	25.9	37.1
12	17.5	39.4	24.8	35.11
13	11.5	12.3	5.22	12.9

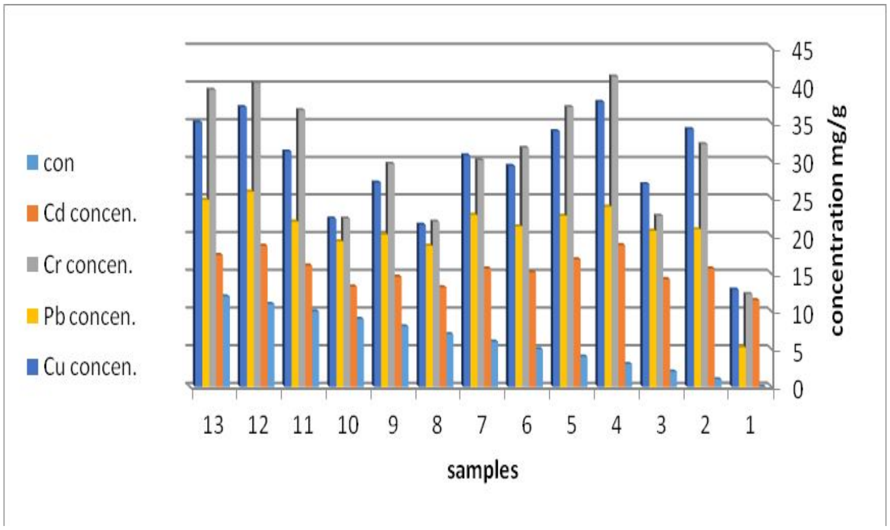

Fig. 1 : Elements percentage by concentration values.

component was 37.8mg / g dry weight In sample no. 3 and 12.9mg / g in dry weight in sample 13 (table 1, fig. 1). The increase in concentration in plant samples is due to the high absorption capacity of the plant for these elements, albeit at low concentrations, this indicates the danger of planting plants in soils contaminated with heavy elements and indicates the ability of sunflower germination to absorb and accumulate the studied elements. These results agree with Alegria *et al*. (1991) that environmental pollution has a significant impact on the food chain for human and animals The soil is the most important part of the environment. It receives the toxic and heavy metals from different sources. These results are consistent with Al-Ali's (1996) finding that when the soil content of cadmium is highthe content of plant parts of this component is also high (Malone *et al*., 1974) found that the lead absorbed by the plant collects in the cell wall and this assembly keeps the cell from its toxic effect. In the maize plant, the lead is concentrated in Dictyosome vesicles and merges with it, leading to increased deposition. These deposits are then removed from the cytoplasm of the cell outside the plasma and integrated into the cell wall.

Conclusion

The ability of *Helianthus annuus* sunflower plant to withdraw and accumulate heavy elements such as cadmium, chromium, lead and copper to reduce soil pollution.

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