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Evaluation of Some Heavy Metal Contamination in *Malva parviflora* L. Plant and Soil Obtained from Gardens of College of Agriculture-University of Baghdad

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Abstract: Heavy metals are given significant interest throughout the globe due to their toxic, mutagenic effects even at very low concentrations. Several cases of human diseases, disorders, malfunction and malformation of organs due to metal toxicity have been reported. Reports indicate that lead, cadmium and chromium may cause a wide variety of changes in biological systems, even at very low concentrations. Samples of different parts of *Malva parviflora L.* (leaves, stems and roots) and associated soils collected with increasing distance of 5, 25, 50, 100m from the gardens surrounding the chemistry labs in college of agriculture university of Baghdad in Abu Ghraib region in Baghdad. The parts of Malva parviflora L. (leaves, stems and roots) and the soil samples at depth 0-20cm were analyzed by atomic absorption spectroscopy after chemical treatment using acid digestion procedures, the pH and the electric conductivity of the soil were also measured. The concentrations Pd, Cr and Cd in the soil and plant of *Malva parviflora L.* were compared with the maximum allowable limits in different countries and they were beyond the maximum allowable limits in the plant samples but in the soil samples they were below the maximum allowable limits in the case of cadmium and below but very close to the maximum allowable limits of lead and chromium.

Key words: *Malva parviflora L.*, heavy metal contamination, soil, plants

INTRODUCTION

Malva parviflora L. is an annual or perennial herb that is native to Northern Africa, Europe and Asia and is widely naturalized elsewhere. Common names include cheese weed, cheese weed, mallow, Egyptian mallow, least mallow, little mallow, mallow marshmallow, small-flowered mallow, small-flowered marshmallow and small flower mallow. *Malva parviflora* L. has a decumbent or erect habit, growing to 50 cm in height. The broad leaves have 5 to 7 lobes and are 8 to 10 cm in diameter. It has small white or pink flowers with 4 to 6 mm long petals (Beer and Howiem, 1985).

Malva parviflora L. is used as a food and also widely used in traditional and modern medicine for so many treatments, the leaves and roots were used to treat asthma, eczema and different kinds of inflammation (Bouriche *et al*., 2011; Shale *et al*., 1999). *Malva parviflora* L. leaf extracts possess anti-inflammatory and antioxidant activities. it has so many active compounds like flavonoids that can decrease the growth of some kinds of bacteria like (*Bacillus subtilis*, *Staphylococcus aureaus*, *E. coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa* and *Salmonella typhi*) (Hailu *et al*., 2005; Jasim, 2006; Afolayan *et al*., 2008; Spira and Wagner, 1983; Shale *et al*., 2005; Seyyednejad *et al*., 2010; Abbas *et al*., 2011). However it can be contaminated with heavy metals if it grows in contaminated soils and water. The high concentration of heavy metals in soils is reflected by higher concentrations of metals in plants and consequently in animal and human bodies. The ability of some plants to absorb and accumulate toxins makes them useful as indicators of environmental pollution. Metal accumulation in vegetables may pose a direct threat to human health.

Heavy metals are one of the important types of contaminants that can be found on the surface and in the tissue of fresh vegetables. Heavy metals, such as cadmium, copper, lead, chromium and mercury, are important environmental pollutants, particularly in areas under irrigation with wastewater these metal can cause environmental hazards and are reported to be exceptionally toxic (Nadine Al-Chaarani *et al*., 2009; Abdul-Wahab *et al*., 2009).

Lead is a toxic element that can be harmful to plants, although plants usually show ability to accumulate large amounts of lead without visible changes in their appearance or yield. In many plants, Pb accumulation can exceed several hundred times the threshold of maximum level permissible for human. The introduction of Pb into the food chain may affect human health and thus, studies concerning Pb accumulation in vegetables have increasing importance (Uwah and Ogugbuaja, 2012; Hamid Iqbal *et al*., 2013).

Heavy metals are given significant interest throughout the globe due to their toxic, mutagenic and teratogenic effects even at very low concentrations. Several cases of human diseases, disorders, malfunction and malformation of organs due to metal toxicity have been

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reported (Subramanian *et al*., 2012). Reports indicate that lead, cadmium, chromium and arsenic may cause a wide variety of changes in biological systems, even at very low concentrations. Some elements including arsenic, cadmium and chromium are carcinogenic. Others, such as lead and mercury have been associated with developmental abnormalities including autism in children. Heavy metals may be present either as a deposit on the surface of vegetables, or may be taken up by the crop roots and incorporated into the edible part of plant tissues. Heavy metals deposited on the surface can often be eliminated simply by washing prior to consumption, whereas bio-accumulated metals are difficult to remove and are of major concern (Emmanuel and Edward Olorunsola Olanipekun, 2010). The aim of this work is to evaluate the levels of some heavy metals (lead, cadmium and chromium) in soil samples and *Malva parviflora* L. plant samples collected from the gardens nearby chemistry laboratories of college of agriculture-university of Baghdad.

MATERIALS AND METHODS

Samples of different parts of *Malva parviflora* L. (leaves, stems and roots) and associated soils collected with increasing distance of (5, 25, 50, 100 m) from the gardens surrounding the chemistry labs in college of agriculture in AbuGhraib in Baghdad. Plant samples were collected in their growing season and dried at room temperature for 14 days and grinded with an electric grinder and acid digestion was preformed and the levels of Pd, Cd and Cr were determined by flame Atomic absorption spectroscopy.

Soil samples were dried at room temperature for 7 days and sieved (2 mm sieve) then weighing 0.5 g from the soil sample and digest it with HNO_3 acid after digestion Pd, Cd and Cr were determined by flame Atomic absorption spectroscopy. the pH and the conductivity of soils were also measured (Emmanuel and Edward Olorunsola Olanipekun, 2010; Schofield and Taylor, 1955).

RESULTS AND DISCUSSION

Cadmium is highly toxic for the human bio-system, taken up from the soil, water, fertilizers, pesticides treatment and anthropogenic operations even at very low levels of intake (Hunt, 2003; Kabata and Pendias, 1992; Shad *et al*., 2008; Ewers, 1991). Analysis of heavy metals in the plant samples shows that cadmium was found in the least concentration among all the detected elements as shown in Table 1.

In all the selected distances, the cadmium was found to be in the range of 0.38-1.0 µ/gg. Maximum permissible limit (MPL) for Cadmium (Cd) recommended by World Health Organization (WHO) is 0.3 mg/kg while the daily dietary intake (DDI) is 0.057 mg (World Health Organization, 1998). The FAO/WHO maximum permitted levels or limits of the respective metals in vegetables are: Pb, 0.3 µ/gg; Cd, 0.1 µ/gg (FAO/WHO, 2001) which means that levels of cadmium detected in *Malva parviflora* plant samples are above the maximum limits. Maximum permissible limit (MPL) for Lead (Pb) recommended by World Health Organization (WHO) is 10 mg/kg (World Health Organization, 1998). Maximum permissible limit (MPL) for. An elevated concentration between 5-30 mg/kg can lead to yield reduction in plants and bleeding tendencies, ulcer, GI upset, lack of immune system (Kabata and Pendias, 1992; FAO/WHO, 2001; Khan *et al*., 2008). Elevated lead levels, due to plant uptake, is known to cause a series of metabolic changes in plants such as decreased growth, delayed flowering and reduction in quality. In addition, this can bring Pb into the human food chain, thus becoming a major concern for health. Like most heavy metals, Pb can bio accumulate overtime and reside in the body for long periods, thus it is necessary to detect such metals even at very low concentrations. exceeding normal concentrations leads to accumulation and toxicity that can result in hepatitis (Khairiah *et al*., 2004). In the analyzed samples of this study, lead levels ranged from non-detectable to 14.2 µ/gg. The FAO/WHO maximum permitted levels or limits of lead are: Pb, 0.3 µ/gg this means that the levels of lead detected in *Malva parviflora* L. plant samples are beyond the maximum permitted levels.

Exposure to chromium may occur through breathing air, drinking water, or eating food containing chromium or even through skin contact (Radwan and Salama, 2006). In human beings and animals, it is considered to be an essential metal for carbohydrate and lipid metabolism within a certain range of concentrations (up to 200 µg/day) Maximum permissible limit (MPL) for Chromium (Cr) recommended by World Health Organization (WHO) (World Health Organization, 1998) is 1.5 mg/kg while the dietary intake is 0.2 mg/day, chromium accumulation and toxicity can cause gastritis, ulcers and lung cancer (Henok Baye and Ariaya Hymete, 2013; Concon, 1988; Shils *et al*., 1994; NRC, 1989).

The chromium content of the samples studied ranged from 5.1-29.6 µ/gg. The values of the metals in soils obtained in this study shown in Table 2 were as

Table 1: Concentrations in µ/gg of heavy metals (Pd, Cr, Cd) in plant *Malva parviflora* L.

	Pd µ/gg			Cr µ/gg			Cd µ/gg		
Distance	Root	Stem	Leaf	Root	Stem	Leaf	Root	Stem	Leaf
5 m	15.8	8.14	2.14	17.2	12.5	11.8	0.86	0.38	0.69
25 m	17.3	7.59	5.77	19.5	10.6	27.7	0.90	0.40	1.00
50 m	1.64	14.2	n.d.	29.6	5.1	20.0	0.72	1.00	0.73
100 m	1.10	5.95	4.19	8.2	23.8	17.1	0.24	0.36	0.72

n.d. Refers to non-detectable

Table 2: Concentrations in µ/gg of heavy metals (Pd, Cr, Cd), pH and conductivity values in soil samples

Distance	pH	EC	Pd (µ/gg)	Cr (µ/gg)	Cd (µ/gg)
5 m	6.43	8.8	30.7	90.3	1.03
25 m	6.70	2.9	n.d.	95.6	0.43
50 m	6.69	2.3	80.3	97.0	0.83
100 m	6.67	3.6	n.d.	82.3	0.53

n.d. Refers to non-detectable

following Pd from nd-80.3 µ/gg, Cr 82.3-97.0 µ/gg, Cd 0.43-1.03 µ/gg. The values of the metals are below the guidelines for maximum limits (ML) of some metals in soil as adopted by FAO/WHO (2001) for the cadmium but it was very close to the maximum limits for both the chromium and the lead elements. These maximum limits (ML) of metals in soil included: Pb, 100 µ/gg, Cd, 3 µ/gg; Cr, 100 µ/gg (Lacatusu, 2000).

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