Estimating Soil Pollution Range with Heavy Metals in Some Areas of Baghdad City

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Abstract

The current study aims to identify soil pollutants from heavy metals as they were taken 23 soil samples and divided into six regions lies in Baghdad governorate, they included (Amiriya, Sayyidia, Yarmouk, Naffak Al-Shurtah, Palestine Street, Adhamiya). The ratio of heavy metals measured in these soils and it observed that iron has the highest average of values and It was in Amiriya city and it reached to 287.67ppm and highest Zn average was in Adhamiya city and it reached to 45.67ppm and the highest average of Mn in the Amiriyya city and it was 65.25ppm, while pb made highest average values in Adhamiya city and it was 33.53ppm, while copper recorded the highest average values in Saidia and it reached to 18.57ppm. Finally, both cadmium and nickel recorded high average values in Saidia city and it was (4.42-68.05) ppm, respectively, moreover Heavy metals values compared with standard, as the values of Fe, Zn, Cu, pb, Ni,Mn, were within the allowed limits in the soil, for as for Cd it was not within limits standard.

Keywords: *Soil pollution, heavy materials, Baghdad city.*

Introduction

Environmental pollution in some developing countries may happened due to the negative impact of technological developments, like urbanization and industrial development which happened because of bad planning for waste disposal and management[1,2,3]. Pollution sources include accidental leakage or leakage of chemicals in addition to human activities, surface runoff, atmospheric precipitation of chemicals used in agriculture or manufacture, materials stored or dumped over or inside the soil in addition to transported or filled pollutants and demolitions which may lead to soil and water pollution even Inside residential locations[4,5]. Abegunde & Adelekan[6],[7] assured that survival and continousty of heavy elements in the environment may lead to bioaccumulation and causing many dangers for some creatures more than if it found in the environment alone, so Heavy metal pollution threatens agriculture And other human food sources in addition to its effect on vegetation growth and low plant resistance to different pests.

Materials and Method

Sample Collection: Samples collected from January 2019 until the end of February 2019, 23 samples from 6 stations (agricultural nurseries) lies in Baghdad city and it included (Amreya, Sayyidia, Yarmouk, Baffak Al-Shurtah, Palestine Street, Adhamiya), samples collected randomly From the surface layer of the soil (5-10 cm depth) using pre-sterilized augar and it transferred to sterile polyethylene bags and taken to the lab to analyze and examine it. To Measure heavy metals in the soil, Method was followed[8].

Results and Discussion

Fe: Amiriya city recorded the highest values of iron averages, it reached to (2784.67 ± 22.22) ppm and the lowest averages values recorded by Adhamiya city

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and it reached to (2641.80 ± 74.37) ppm and the results of the statistical analysis showed that there were no significant differences between the averages where the value of LSD was (187. 09) in P <0.05 level as table (1) shows. Fe is a nutritional element organisms need to, including microbes, plants and the rest of organisms. Iron available in many rocks and Ground metals and during soil development this content Exposed to to enrichment or depletion, as the presence of calcium carbonate And bicarbonates in very large quantities impede the absorption of iron by living organisms and the soil pH plays an important role in this absorption and the abundance of iron in the soil [9]. The current stud results agreed with some of the previous studies, as the current study of iron recorded very high values and it is likely that the high concentrations of iron in the soil will be due to the fact that Iraqi fertilizers added to the soil contain high amounts of iron [10], as World Health Organization [1] indicated that the allowed limits for iron in water were 0.3 ppm.

Zn: Adhamiya city recorded the highest values of iron averages where it recorded (45.67 ± 5.74) ppm and the lowest averages values recorded by Yarmouk city and reached to (26.63 ± 1.88) ppm and the results of the statistical analysis showed that there were significant differences between the averages where the value of LSD (13.50) at the level of P <0.05, as in Table (1). The results of examining the element zinc in the soil showed that it is within the allowed limits. Contrast relationship between zinc and other positive ions, especially Cu + 2 and Fe + 2 irons, reduces zinc Absorb. And the high concentration of phosphorus also reduces zinc absorb, which is the most common reaction in soil types that have a limited amount of zinc [11]. This agree with [12] by his current study of heavy elements pollution to the sides of the highway between Al-Ramady and Al-Rutbah cities, as the allowed concentrations of zinc in the soil ranged between (150-300) ppm, as World Health Organization [1] indicated.

Mn: The current study results found that the highest averages value of the of manganese in the soil was (65.25 ± 3.65) ppm, in soil samples in the Amiriya city, while the lowest average value (55.16 ± 5.68) ppm was in soil samples for Naffak Al-Shurtah area. LSD test shows that there were no significant differences at the level (P <0.05) between these data because of its value which was (17.35) Table (1) and as noted from the table that the values of manganese averages ranged between (55-65) ppm, So it Considered within the allowed limits

in the soil, where it reached (300) ppm [2]. The current study results agreed with [13,14] in recording the current study with high values of manganese in the soil samples under study that were within the allowed limits.

Pb: current study results recorded the highest values of lead averages in Adhamiya city and it reached to (33.53 ± 5.82) ppm, either lowest averages values recorded in Yarmouk city and it were (22.10 ± 1.64 (ppm), It is the same for Amiriya city, which also recorded low levels of lead in soil samples under study, where the averages values were (23.43 ± 1.61) ppm. Statistical analysis results indicated the presence of significant differences between averages values of soil samples, where the value of LSD (11.38) at the level of P <0.05, Table (1). The values of lead did not exceed allowed limits as World Health Organization [1] indicated and it was (50-140ppm), Current study results from [15] agreed, by registering close values of the lead element in soil samples and this observed in the current study and it may happened due to the convergence of lead concentrations values due to the high stability of the lead element in the soil, as [16] showed that the lead component is not biodegradable by soil biology and remains attached to soil particles and is transported from a place to another by the wind. The recording of low lead values in soil samples may happened due to the high susceptibility of the roots of the plants in the soil samples under study to the absorption of this element from the soil and its accumulation within the parts of the plant and this what [17] assured .

Cu: Current study results recorded copper highest averages values in the Saidia city and it reached to (18.57 ± 4.92) ppm and Yarmouk city recorded lowest averages values and it were (12.66 ± 0.34ppm). Statistical analysis results indicated that there were no significant differences between soil samples averages values, where the value of LSD (6.73) at the level of P <0.05, Table (1). Current study results of the copper element in soil samples were within allowed limits that were (50-140) ppm according to the World Health Organization [1]. Heavy elements, such as lead, cadmium, copper, nickel, mercury and other elements are the most dangerous pollutants for soil, water and air and the most important sources of pollution with these elements are Exhausts are automobile waste and factory waste, metal smelting, combustion of coal and incorrect method of using pesticides and fertilizers [18]. Minor concentrations of copper element in the soil may happened due to soil base elevation, as in the oxidizing acidic medium or in

the acidic oxidizing environment the copper element has a high mobility and agricultural activities may add large amounts of copper element to the soil [16]. Current study results agreed with [19], in recording low values of copper in the soil, which the researcher attributed that to the inability of some heavy elements such as copper, lead, nickel, cadmium and mercury to solubility in the soil, which lead to their accumulation in the soil.

Cd: Current study results showed that the highest value average of cadmium in the soil was (4.42 ± 1.19) ppm, in soil samples in Saydiya city, while the lowest average value was (2.48 ± 0.11) ppm in the soil samples for Amiriya city, This results were approach to Naffak Al-Shurtah and Yarmouk cities, where they recorded average values of (2.51 ± 0.11) and (2.96 ± 0.19) ppm, respectively. LSD test shows a significant difference at the level of (P <0.05) between this data because of its value which was (1.597) Table (1) and as noted from the table that the values of cadmium averages exceeded the allowed limits according to the World Health Organization [1] Where the values ranged between (1-3) ppm. The addition of heavy metals leads to many changings in the metabolic activity of microorganisms which is represented by a decrease in the ATP concentration and respiration rate. Many enzymes secreted by microorganisms contribute to the recycling of materials and nutrients that exsist in the soil and therefore the rate of transformation of these substances adjusted when heavy metals added to the Soil, because it effects on the activity of extracellular enzymes [20].

Ni: Current study results recorded highest values of nickel averages in Adhamiya city and it reached to (68.05 ± 7.41) ppm, either the lowest averages values recorded by Amiriya city and it were (22.10 ± 2.86) ppm. Statistical analysis results indicated that there were significant differences between soil samples averages values, where the value of LSD (21.126) at the level of P <0.05, Table (1), the values of the averages for the current study were within the allowed limits in the soil according to the World Health Organization [1] where the values ranged between (30 - 75) ppm. The highest mean values recorded by the current study of the nickel element may happened due to some human activities and environmental factors that would increase the concentrations of this element and from these salinity factors as they play an important role by reducing the toxicity of heavy elements by forming complexes with chloride ions and make the element not bioavailable to microorganisms [21]. Concentrations of nickel and heavy elements can also increase as a result of sedimentation of the atmospheric components near the mineral refineries as well as from the applications of the bio-solids and sludge generated from wastewater and thus becomes a very toxic heavy element for soil rehabilitation [22], Soil factor is the most important and influencing on the availability of nickel and its solubility is the pH, as the amount of nickel available to the plant decreases with the high acidity of the soil and therefore the plants that grow in lands with high pH may be more vulnerable to the occurrence of nickel deficiency in them [23], Study results agreed with the researchers above in recording high nickel values in the soil and that they considered within allowed limits. Also, the presence of high concentrations of positive heavy elements such as iron in the soil leads to reducing the absorption of nickel in the soil and this was confirmed by the correlation coefficient between iron and nickel, as it reached to (-0.06) at the level of P <0.05 and this was confirmed by researchers [24]. As the researchers found an antagonistic relationship between nickel and zinc and iron.

Table (1): Shows averages values and heavy metals standard error in the soil (Fe, Zn, Pb, Mn, Cu). In six soil samples

Standard Error±Average						
Source of Sample (Soil)	**Ni**	**Cd**	**Cu**	**Pb**	**Mn**	**Zn**	**Fe**
Amiriya	22.10±2.86	2.48±0.11	14.35±1.44	23.43±1.61	65.25±3.65	31.75±5.54	2784.67±22.22
Sayyidia	4.42±1.19	4.42±1.19	18.57±4.92	26.32±2.30	58.90±9.85	29.20±3.88	2657.00±62.95
Yarmouk	2.96±0.19	2.96±0.19	12.66±0.34	22.10±1.64	56.40±3.63	26.63±1.88	2706.00±25.05
Naffak Al-Shurtah	2.51±0.11	2.51±0.11	13.36±0.44	31.93±4.90	55.16±5.68	39.18±4.56	2760.67±12.45
Palastine street	3.27±0.23	3.27±0.23	13.95±0.77	26.33±2.06	57.59±2.39	37.60±3.36	2702.50±73.66
Adhamiya	3.58±0.19	3.58±0.19	15.34±1.20	33.53±5.82	56.42±5.78	45.67±5.74	2641.80±74.37
LSD value	1597*	1.597*	6.73 NS	11.38*	17.35NS	13.50*	187.09NS
* (P<0.05).							

Conclusions

1. Heavy metals are very dangerous materials for all life forms.

2. The concentrations of heavy metals were within the permissible limits, but the cadmium recorded very high concentrations.

3. The high concentrations of heavy metals under the current study are a danger to human life if the soil is used in agriculture, especially cadmium and causes many diseases.

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