ISSN NO: 2771-8840
Date of Publication: 07-03-2023

Leaf Plants ability to absorb heavy metals (Cd, Cr, Fe) from naturally polluted soil

Aqeel Lami 1 , Shahla Hussien Hano 2, Reyam Naji Ajmi 3, Nadia Kamil Bashar4
1,3,4 Department of Biology Science, Mustansiriyah University, POX 46079, Iraq-Baghdad.
2:Collage of Medicine,Ibn Sina University of Medical and Pharmaceutical Sciences, Iraq,Baghdad
reyam80a@uomustansiriyah.edu.iq

Abstract: Effective cleaning necessitates the reduction or elimination of toxicity, the use of plants to remove or detoxify environmental pollutants, or the immobilization of the pollutants in the growth matrix in the soil through biological and biological nature, chemical, or physical activities or processes somewhere in the city of Baghdad, the current situation. Because minerals cannot disintegrate and element concentrations are high, it takes a while for the mechanisms to reduce the percentage of mineral contamination in soils (Cd, Cr, Fe), to determine the association between plants using an average of data from plants that varied from one another in terms of their capacity to absorb lead and the concentration in three key plant types. *Eucalyptus camaldulensis, Cupressus dupreziana,* (0.033, 0.018)ppm. The elements may dissolve in water, which could lead to their migration into the soil and up the food chain. Many industrial activities, such as mining, mineral processing, and chemical production, result in an increase in the concentration of non-essential minerals in the water levels in the areas surrounding industrial sites.

Keywords: Indication Leaf plants, Soil, Elements, Pollution

1- Introduction

Metals are not biodegradable, unlike many other materials, therefore they collect in the environment, which has raised concerns about their growing accumulation. Mercury, Iron, Zinc, Arsenic, Lead, Cadmium, and Chromium are among the metals that pollute the environment. They are released into the environment through industrial waste (1).

Attempts are currently being made to clean up the environmental elements using new technologies such as: soil flushing, stabilization and solidification, electro kinetics chemical reduction and oxidation, low temperature thermal desorption, soil washing, incineration, and vitrification, excavation and retrieval, fracturing pneumatic, and landfill disposal, Since these are expensive, much attention has been given to the potential function of bioremediation, particularly by higher plants. Higher plants accumulated metals in the soil around them, but at varying rates and concentrations (2).

When something enters the environment due to human activity in large enough numbers to cause change and unfavorable impacts, it is referred to as pollution (3). The soil is constantly adjusting to changes in environmental conditions; some of these changes may be temporary and reversible right away, while others will be permanent, which lowers production (4). Heavy metals pollute soils, which causes plants growing there to produce less, perform worse, and have an impact on the physical, chemical, and biological characteristics of the soil. Acid rain, fertilizers, pesticides, organic manure, leather products, radioactive waste, discarded food, plastics, and organic manure are just a few of the things that contribute to soil pollution. Numerous research employed wastewater containing excessive amounts of heavy metals for irrigation (5).

Both independently and in combination with other soil components, heavy metals can be discovered (6). Despite the fact that plants require heavy metals for growth, too much of it can be dangerous. The growth and activity of the soil are negatively impacted by heavy metal pollution, and this in turn reduces the nutrients available to the soil, which in turn inhibits plant growth. (7). The amounts of contaminating agents that plants can tolerate are generally high. When present in small amounts, some of it provides the micronutrients that plants need, while larger amounts could promote the growth of undesirable organisms (8). Several scientists

ISSN NO: 2771-8840
Date of Publication: 07-03-2023

have discovered that specific plants, including sunflower (Helianthus annuus L.), corn (Zea mays L.), and Indian mustard (Brassica juncea), have been used in trials on phytoremediation because they have a high tolerance to heavy metals (9,10). Assess the plants that store the corresponding heavy metals, ascertain the translocation of the metals from soil to plant, test the plants, and determine the concentrations of some heavy elements (Cd, Cr, and Fe) in the plants and soil of the study areas. These steps will help you understand the concept of phytoremediation with the important goal of identifying the changes that had taken place in the soil of the area in some sites of Baghdad city.

2. Experimental

2.1. Sampling

In December 2022, samples were gathered from the study locations.

First, biological samples The region was examined for plants, and the most prevalent ones were chosen and collected in clean plastic bags. Three fundamental plant species were selected *Eucalyptus camaldulensis*, *Cupressus dupreziana*

Eucalptus (Class: Magnoliopsida, Family: Myrtaceae, Gens: *Eucalyptus camaldulensis*).

Cupressus (Class:Pinopsida , Family:Cupressaceae, Genus: *Cupressus Cupressus*)

Plant samples were taken, completely rinsed with deionized water, and then allowed to dry outside for 3-5 days at room temperature before being pulverized in an agate mortar in preparation for analysis , second environmental sample with each plant type's surrounding soil taken from the same region at a depth of 10 cm, one sample of the soil far from the plants was also taken from the same area, making a total of two types of plants, two samples of soil surrounding them, and two samples of soil distant from the plants.

2.2. Planning Experimental and Analytical Work:

The General Corporation for Foodstuff Trade and the quality control division of the Ministry of Commerce have researched how to identify elements using atomic spectrometers of the 700 type. The substance being measured must be liquid, therefore solid samples of all kinds must first be melted and then regulated into solutions. The preparation of samples for Top wave analytic Jena type analysis included method validation, which was used as a reference material. After weighing all samples (plant and soil) at 50 mg and adding 5 ml of nitric acid HNO3%65 to the digestion vessel. Following this, the liquid was carefully shaken or swirled with a clean glass bar as necessary, and the jar wasn't sealed for at least 20 minutes Moreover, to avoid foaming and splashing, wait until the containers have cooled to the same room temperature after being heated in the microwave (20 min).

The digestion vessel was cautiously opened in a fume hood while donning hand, eye, and body protection because a sizeable volume of gas would be produced throughout the digesting process. After that, the samples were quantitatively transferred to Falcon tubes and diluted with deionized water to a volume of 15 ml. For the quality control analysis, 0.250 g was put into a Teflon container, reconstituted with 2 mL of deionized water, and then 4 mL of HNO3 were added. Each sample was digested three times, and calibration blanks composed of 2.0 mL deionized water underwent the same process. The detection limits for the heavy metals (Cd, Cr, and Fe) in this inquiry were calculated by applying three times the standard deviation of the average of five blank measurements to one test (11, 12).

2.3 The concept of geographic information system (GIS):

Geospatial information systems stand out from other data analysis because they are closely correlated with location and the proper spatial relationships between them, demonstrating the analytical strength of (GIS) data storage in several layers. This method has the best analytical capability since it incorporates features from each layer with the same categorization, which helps to overcome technological challenges associated with processing massive volumes of information simultaneously (13).

3. Results and Discussion

3.1Graphical Map of the spatial analysis:

ISSN NO: 2771-8840
Date of Publication: 07-03-2023

A graphical Map of the spatial analysis to all the variables of the study areas has been identified on the basis of natural environmental (Soil) and biological factors (Plants) affected by phytoremediation system in some location in Baghdad city, depending on the longitude and latitude that have been taken by GPS/Geko 201. Graphical representations of the data that were gathered were taken into account while determining the entrance of the variables as small spots spread throughout the data that have been recognized in a variety of influencing factors, such as topography and human activity. The most popular GIS interpolation techniques were employed to analyze and interpret spatial data based on the ecological properties of Cd, Cr, and Fe accumulation (13,14,15). The highest level of skill concentration in study areas has been attained by applying authenticity checks on websites and conformance with all input data.

According to the average results of the plants, there is a relationship between the plants that differs from one to the next depending on the content in and each plant's capacity to absorb lead. This relationship indicates that the variables with positive correlation coefficients and P values under 0.050 tend to rise together. In Fig (1,2,3) Showed Depending on the proximity of the soil from which the plant is growing and the soil distant from it, different plant species have different concentrations of Cd in the soil. Findings were examined and contrasted with information from their published label and suggested guidelines (16). There is no significant association between the two variables, soil and plants, in any area with negative correlation coefficients P values greater than 0.050, P=0.425.

High levels of Cd in the soil and an accumulated concentration of Cd in the soil that exceeded the maximum values found when compared to standards were additional characteristics of the plants from these sites (17), This concurs with a number of studies conducted in Baghdad (18) between plants and soil (0.895 - 1.315 ppm) and (Safaa, 2016); Respectively (1.2- 2.9 ppm) between plants and soil; and (19) between plants and soil respectively.

There is a very high concentration in the soil that is present in plants, particularly those that are far from farmed soils. The ability to extract Cd, Cr, and Fe from the soil and plant species (*Eucalyptus camaldulensis, Cupressus dupreziana)* is represented in Figs. 1, 2, and 3 by the bioconcentration factor (BCF). BCF levels represent a component that is moving from the soil to the plant. Cd In order to ascertain the movement of Cd from the roots to the aerial parts of the plant, metals that are acquired by plants and are primarily kept in the leaf of plants have a translocation factor greater than one that indicates translocation to the aerial parts of the plant. Moreover, according to (20), a significant factor contributing to the elevated Cd concentration in urban soils is transport-related soil. In urban settings, cd buildup from a variety of sources, including gasoline, has been reported to accumulate to high levels. Largest industrial region in Baghdad Human resources may contribute to the rise in Cd concentrations in the soil due to the electrical and petrochemical industries, which are surrounded by heavy traffic and automobiles. It has been noted that vehicle emissions have a substantial impact on the deposition of Cd. Cd's detrimental effects on soil components mean that its impact on the soil ecosystem lasts for years (21).

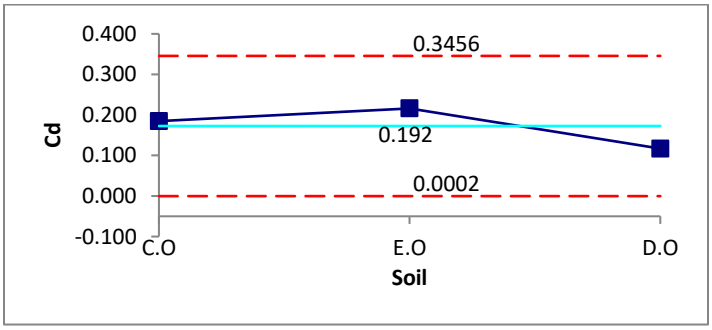

Fig 1 Comparison of the Cd concentration in soil from *Cupressus dupreziana and Eucalyptus camaldulensis* in the study region.

ISSN NO: 2771-8840
Date of Publication: 07-03-2023

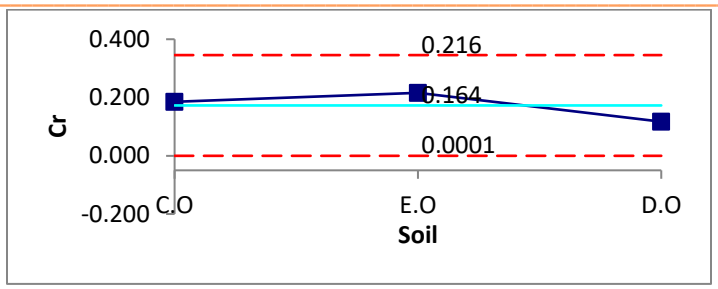

Fig 1 Comparison of the Cr concentration in soil from *Cupressus dupreziana and Eucalyptus camaldulensis* in the study region.

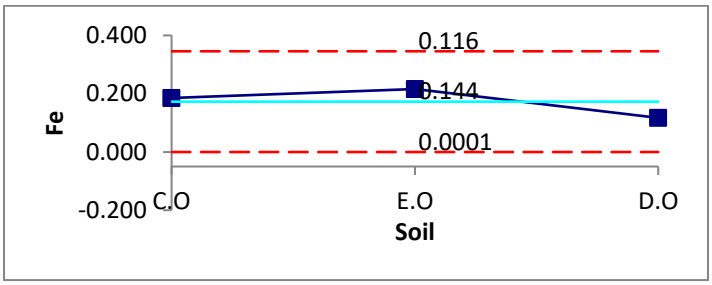

Fig 3 Comparison of the Fe concentration in soil from *Cupressus dupreziana and Eucalyptus camaldulensis* in the study region.

A graphic map of the spatial analysis to all the variables of the study areas has been identified based on the natural environmental (Soil) and biological factors (Plants) affected by phytoremediation system in some locations in Baghdad city, according to the longitude and latitude that have been taken by GPS/Geko 201.
The graphic pictures that were produced took into account the variables' introduction as little dots spread across the data that have been linked to many influencing factors, including topography and human activity. The most common GIS interpolation techniques are applied through the process of spatial analysis and interpretation based on the ecological characteristics of lead, zinc, and iron accumulation (13,15). The resulting contour general map in research areas is shown below. It was utilized to attain the highest level of ability concentration after verifying authenticity sites and conformance with all input data. Fig. (4) displayed the three elements' general Arc10 Map GIS development under study area .

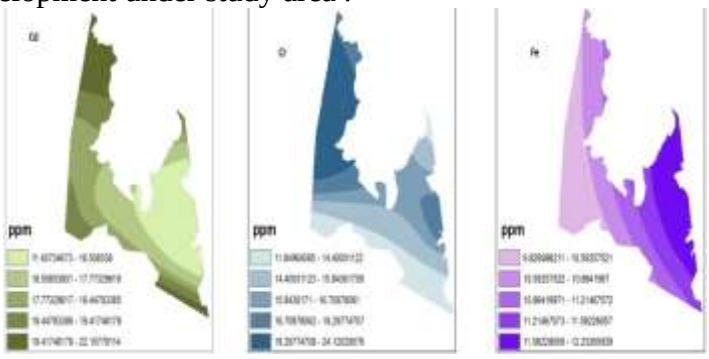

Fig 4 : General Arc10 Map GIS development in the three elements under study area .

Conclusions:
The aptitude and tolerance of various plant kinds to phytoremediation technology is essential for the survival of tree species. Plant species, soil conditions, PH, and soil texture are just a few examples of the variables that may

ISSN NO: 2771-8840
Date of Publication: 07-03-2023

be used to determine how well trees adapt to their surroundings in the soil. These variables can also be used to raise the tolerance of plants to detoxify soils from inorganic pollutants standard analytical methods Top Wave Analytic is used to analyze the samples and make sure they meet all international legal, safety, and quality criteria in order to identify. The findings indicated that all plants have (Cd, Cr, and Fe) concentrations, although these concentrations vary across plants according to their capacity to absorb these elements and the level in dominant plant species. Eucalyptus camaldulensis follows Cupressus dupreziana in order. It was within the permitted standard limits for the study area, and as such, it can be recommended that other new technologies, such as phytostabilization, phytoextraction, and rhizofiltration, focus on working spatial information about the idea of the relative risk between variables in environmental and biological factors in the food web. Due to the rapidly building up of pollutants in nature, it is urgent to take action to monitor and control the level of this contaminant as well as other elements like vanadium and mercury and evaluate the effectiveness of other types of plants. Additionally, it is possible to continuously wash the streets to remove the accumulated dust on the edge of the roads and loaded with pollutants, especially those emitted from the exhaust of cars and human waste of all types.

Acknowledgment: The authors would like to thank Mustansiriyah University (www.uomustansiriyah.edu.iq) Baghdad – Iraq for its support in the present work and extremely grateful to Collage of Medicine,Ibn Sina University of Medical and Pharmaceutical Sciences, Iraq ,Baghdad for their cooperation and all the people help us to get our data.

References:

1. Allén, A. La interfase periurbana como escenario de cambio y acción hacia la sustentabilidad del desarrollo. Cuad. CENDES2003, 20, 7–21. Available online: http://ve.scielo.org/scielo.php?pid=S1012-25082003000200002&script=sci_arttext (accessed on 4 November 2021).
2. APHA, Standard methods for the examination water and wastewater, 18th Ed., American Public Health Association, APHA Press, Washington D.C., 1998.
3. Baden, B.M.; Coursey, D.L. The locality of waste sites within the city of Chicago: A demographic, social, and economic analysis.
4. Guney, M; Onay, T. T. and Copty, N. K. (2010). Impact of overland traffic on heavy metal levels in highway dust and soils of Istanbul, Turkey.Environ. Monit. Assess. 164:101–111.
5. Canning, L.; Szmigin, I. Death and disposal: The universal, environmental dilemma. J. Mark. Manag. 2010, 26, 1129–1142.
6. Da Cruz, N.J.T.; Lezana, Á.G.R.; Freire dos Santos, P.D.C.; Santana Pinto, I.M.B.; Zancan, C.; Silva de Souza, G.H. Environmental impacts caused by cemeteries and crematoria, new funeral technologies, and preferences of the Northeastern and Southern Brazilian population as for the funeral process. Environ. Sci. Pollut. Res. 2017, 24, 24121–24134. [CrossRef] [PubMed].
7. Kafoor, S. and Kasra, A. (2014). Heavy Metals Concentration in Surface Soils of Some Community Parks of the Erbil City. Zanco Journal of Pure and Applied Sciences. Vol.26, No.2, pp. 31-38.
8. Fistola, R. The unsustainable city. Urban entropy and social capital: The needing of a new urban planning. Procedia Eng. 2011, 21,976–984. [CrossRef].
9. Guayasamín Vergara, J.D. Establecimiento De Índices Empíricos Ambientales Para Manejo De Cadáveres Humanos: Entierro Y Cremación En Ecuador. Master's Thesis, Universidad de las Fuerzas Armadas ESPE, Sangolquí, Ecuador, 2021.
10. Hala Mundhir Fattah؛ Frank Caso (2009) ،A brief history of Iraq ،Infobase Publishing. ISBN 0816057672, 9780816057672 Length 318 pages, pp 69.
11. Larkin, M.T. An Analysis of Land Use Planning Policies for Cemeteries in Ontario. Master's Thesis, Ryerson University, Toronto,ON, Canada, 2011.

ISSN NO: 2771-8840
Date of Publication: 07-03-2023

12. Nguyen, T.; Nguyen, L. Groundwater pollution by longstanding cemetery and solutions for urban cemetery planning in Ho Chi Minh City—From reality to solutions. In MATEC Web of Conferences; EDP Sciences: Les Ulis, France, 2018; Volume 193, p. 02008. [CrossRef].
13. Nguyen, X.L.; Chou, T.Y.; Hoang, T.V.; Fang, Y.M.; Nguyen, Q.H. Research on Optimal Cemetery Location Selection using Approach of Fuzzy Set Theory and Analytic Hierarchy Process in Environment of Geographic Information System: A Case Study in Hung Ha District, pages 1–9 Thai Binh province, Vietnam. Int. J. Res. Innov. Earth Sci. 2019, 6, 20–28.
14. Ni¸tˇa, M.R.; Iojˇa, I.C.; Rozylowicz, L.; Onose, D.A.; Tudor, A.C. Land use consequences of the evolution of cemeteries in the Bucharest Metropolitan Area. J. Environ. Plan. Manag. 2014, 57, 1066–1082. [CrossRef] .
15. Peluso, F.; Vives, L.; Varni, M.; Cazenave, G.; González Castelain, J.; Usunoff, E. Evaluación preventiva espacial del riesgo sanitario por la instalación de un cementerio parque. GeoFocus. Rev. Int. De Cienc. Y Tecnol. De La Inf. Geográfica 2006, 6, 1–14.
16. Reyam Naji Ajmi b. Estimation Free Cyanide on the Sites Exposed of Organisms Mortality in Sura River /November 2018. Journal of Global Pharma Technology|2019| Vol. 11| Issue 03 |100-105**.**
17. Scalenghe, R.; Pantani, O.L. Connecting existing cemeteries saving good soils (for livings). Sustainability 2020, 12, 93. [CrossRef].
18. World Health Organization, Ammonia in drinking water-background document for development of WHO guideline for drinking water quality, 4th Ed., WHO Series, Geneva, 2013.
19. World Health Organization, Ammonia in drinking water-background document for development of WHO guideline for drinking water quality, 4th Ed., WHO Series, Geneva, 2012.
20. Fadhil, B.S., Ajmi, R.N.Scanning electron microscope (sem) to examine characteristics plants and soil evidence in Baghdad city, IraqPlant Archives, 2019, 19, pp. 927–930.
21. Saeed, M.S., Ajmi, R.N. Polycyclic aromatic hydrocarbons (PAHs) as biomarkers in the controlling headquarters, Almuthannamilitary Airport, Baghdad, Iraq Plant Archives, 2020, 20(1), pp. 2860–2864.