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THE PROBABILITY OF CALCULATING THE POLLUTION LIMIT IN MINERAL-CONTAMINATED (PB ,CR, CU) IN THE INTEGRATED ECOSYSTEM IN THE CONTROLLING HEADQUARTERS /AL- MUTHANNA MILITARY AIRPORT – BAGHDAD

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ABSTRACT
Globally, pollution is a problem that might have unfavorable outcomes. It is crucial to consider the main causes of soil contamination, such as the integrated ecosystem in the command center at the Al-Muthanna military airport in Baghdad, when trying to solve this problem. The current study's main objectives were to determine whether it was possible to calculate the pollution limit in mineral-contaminated soils and the impact of nearby plants on the air. Following three periods of sampling at three key locations, including the area and leaf of Eucalyptus camaldulensis, many components and variables, including (Pb ,Cr, Cu). Traceable elements were measured and chemically obtained utilizing x-ray fluorescence due to the site's exposure. When samples were digested for a control factor restricting the PTL threshold, materials were examined using ICPES for the qualitative detection of these components. The relative proximity (RP), which is determined by dividing the ICPES value by the sample's XRF values, indicates how close an element is to the sample. Sites 2 and 1, respectively, measured the component's biodegradability, and areas 2 and 3 revealed the highest values. Its plant uptake is 26%, 10%, and 7% in the order of Pb, Cr, and Cu. The data collected show that the integrated ecosystem at the command center and Al-Muthanna military airport in Baghdad has a high potential for contamination.

Keywords: Pollution, Soil , Air, elements.

1- INTRODUCTION

According Wikipedia a published in 2015, Al-Muthanna military airport or official airport in Baghdad, where the first aircraft landed in 1932 and was called the airport Alwshash International Airport is located in the center of the capital Baghdad in the side of Karkh northeast of Baghdad within the coordinates (331924N-442239E) , surrounded by the areas Al-Zawraa Street between Mansour and Allawi districts. The importance of this airport decreased in the late 1970s after the construction of Baghdad International Airport between 1979 and 1982, where it became an airport and a military base. Battles and military strikes that targeted Al-Muthanna military airport by bombed during the US attack on Baghdad in 1991, After 2003 it suffered the invasion of Iraq with cluster missiles, the most violent attack on the airport and was bombed with mortars and homemade missiles by armed groups in

2007-2008 targeted US forces and Iraqi and military units present in it . Iraqi Army units are located in Al-Muthanna Military Airport, the most important of which are (Military Medical Affairs Directorate - Military Medical Committees - Al-Mashalah Hospital - Al-Muthanna Military Hospital - Delivery Center of Martyrs to the Army and Popular Mobilization - Headquarters of the 54th Infantry Division 6th Iraqi Army Division - Volunteering Directorate - Regiments affiliated to Baghdad operations command and Military Discipline command.

Nature soil in it a sandy clay soils that appear solidly unsaturated with water, which is not the right climate for agriculture because of the presence of minerals and organic materials as it cannot be planted and contain large salts and lack of water. About plants types including durable strong trees. After 2003, diesel generators were used this airport by the American and Iraqi forces. There are approximately 60-70 diesel generators on which military units currently rely to generate electricity at the airport. The sick and wounded from the Iraqi army who are attending in it . Iraqi Army patients and wounded are admitted to Al-Muthanna Military Hospital, approximately 400 - 450 patients and wounded daily are sent by all Iraqi army units located throughout Iraq and are offered and treated by military doctors depending on the information of employees at the headquarters for long periods.

Environmentally relevant sources of PAH are smoking, fossil fuel combustion, vehicle exhaust, and use of lubricant oils. PAH are used as intermediate substances in the production of plasticizers, pigments, drying agents, and pesticides, but the environment probably receives only small amounts as a direct result of these activities; the most significant emissions are from incomplete combustion of organic materials during industrial processes and other anthropogenic activities according to (ACGIH, 2007).

Since PAH are lipophilic substances, therefore, it in human body readily dissolved and transported by cell membrane lipoproteins ,blood and urine

In general, they are distributed throughout the body and found in any internal organ or tissue, particularly in lipid rich tissues and the gastrointestinal tract. Experimental animal studies have demonstrated that some PAH cause tumors in case of oral or cutaneous exposure. In food exposure, effects have been found in the reproductive system related to fertility, problems during pregnancy and congenital anomalies(USEPA, 2009), major sources of PAHs are formed during the incomplete burning of coal, oil and gas, garbage or other organic substances like tobacco or charbroiled meat (Kohler, *et al.*, 2000) Due to the numerous PAHs exposure sources, humans can be exposed to PAHs through multiple routes, including breathing polluted air, Environmental Tobacco Smoke (ETS), dietary PAHs intake, dermal absorption through soil, air or particulate deposited on skin (Lee, *et al.,* 2004; Liu, *et al.,* 2016).

The exposure of PAHs in human has raised public health concerns. The United States Environmental Protection Agency (USEPA, 2012) has designated 16 PAH compounds as priority pollutants, among PAHs, benzo pyrene has been classified as a probable human and animal carcinogen by the International Agency for Research (IAR, 2008) The exposure of PAHs

has been linked to the onset of diabetes mellitus , metabolic syndrome and cardiovascular conditions (Markovic,*et al.,* 2015) .

Jacob and Seidel 2002 reported that urinary 1-hydroxypyrene concentration in children (6–11 years old) was approximately 30% higher compared to that in adults under the same conditions, indicating that children seem more susceptible to PAHs and have higher potential health risks compared to monitoring of the external environment measurement of chemicals in air, water, or soil , human biomonitoring reflects internal exposure in the human through different routes of exposure (Viau, 2009). Biomarkers can provide an integrated reflection for exposure through inhalation, food and dermal uptake, and takes into account variation in absorption, metabolism, and elimination by the body. Therefore, the urinary metabolites of these compounds are used as preferred biomarkers to estimate the PAHs exposure (Hansen, *et al*., 2008).

Ecological risk assessment consists of two components assessment of current ecosystem status and prediction of future status. With regard to the former, any measurement that is made must clearly indicate how far the ecosystem under investigation has departed from normal conditions and for what reason. With regard to the predictive component, this necessitates knowledge of how populations comprising the ecosystem will respond to a given pollutant load (Nash, D.G., Leith, D., 2010) . This can perhaps be estimated to some extent from laboratory biomarker studies and from databases amassed from investigations in other ecosystems with similar characteristics. Such a database is currently being assembled. A protocol for the use of biomarkers in ecological risk assessment was formulated by Fossi and Leonzio (1993). The approach focused on establishing the risk to key components in the ecosystem, the inference being that if these components are adversely affected, the ecosystem structure and/or function ecological integrity will be at risk. Their strategy is developed and reformulated below. Three phases of investigation are envisaged which constitute a sequence moving towards the acquisition of increasingly precise data according to Beltran, D.J. (2002).

Phase 1. Identification of ecosystems at risk. This involves the identification of potential pollutants, pathways and fate together with recognition of critical populations and communities in the ecosystem under study. Complex interactions among polluting molecules and the ecosystem should be investigated in an interdisciplinary study using a database evaluation of regional features, analysis of diffusion models, chemical analysis and studies of biotic communities (Fossi and Leonzio 1993). A selected suite of general exposure biomarkers would also be utilized in an initial screening of a broad range of invertebrates to detect pollutant exposures (the justification for focusing on invertebrate species is discussed below). An estimate of how much biomarker values differ among species for a given concentration of the pollutant in the environment may aid the identification of the species at risk. It is important to add here that the biomarker approach is not a replacement for conventional assessment techniques, but is an important supplementary approach of great ecological relevance. Ecological research methods based on the evaluation of the general state of the

population (birth rate, mortality, fertility index, relationship between ages) are indispensable for interpreting links between biochemical and cell changes (biomarkers) and adverse effects on populations and communities.

Phase 2. Identification of critical species and target populations Obviously, it is not feasible to perform comprehensive biomarker studies on all the components of an ecosystem. Identification of the most important populations is therefore necessary. Once the general extent of pollutant exposure have been assessed, more specific effects of pollutant toxicity can be examined using extended suites of exposure and effects biomarkers in a limited range of species occupying different trophic levels and ecological niches; in this way in situ verification of the adverse effects.

Phase 3. Predicting the likely impact of chemical pollutants Prediction of the potential of known amounts of specific pollutants to perturb (or further damage) ecosystems can also be aided by the use of biomarkers. It is proposed here that combined laboratory and field biomarker screening tests be evaluated as a means of establishing a firmer scientific basis for extrapolating from laboratory data to real environments. This might comprise of the following:

(1) Selection of a range of invertebrate species from diverse phyla that exhibit different feeding strategies and that are present in the ecosystem in question. Sample populations of these organisms should then be exposed to a range of concentrations of the test chemical in the laboratory.

(2) Measurement of a suite of biomarkers (biochemical, physiological and behavioral) to assess responses to and toxicity of the test chemical should then be performed. Biochemical biomarkers should reveal the type of detoxification mechanisms induced by the chemical whilst physiological and behavioral biomarkers will signal exposures resulting in adverse effects at the level of the whole organism (such as altered scope for growth, loss of endogenous behavioral rhythmicity, etc.). They will also permit time relationships between chemical exposure and biomarker responses to be established.

(3) Residue analysis of the test organisms should be carried out to relate biochemical biomarker responses in specific tissues to tissue concentrations of the test chemical or its derivatives.

(4) If the test chemical has been released into other similar ecosystems and biomarker responses have been measured in situ, then results obtained in the laboratory test can be compared with the database compiled from field tests.

(5) Once the test chemical has been evaluated and safe concentrations determined, the biomarker approach offers the possibility of genuine validation of the test procedure.

To understand the concept of biomarkers in integrated ecosystems, the important aims that identify the changes that had happened in the environmental areas from various sites were chosen from in the controlling headquarters /Al- Muthanna military airport - Baghdad to determination of the Potential Environmental Risk Factor Index (PRI) for samples.

2. Experimental

: Description and samples collection of the study area:

Three stations were selected on the basic location from Al-Muthanna military airport in Baghdad in the center of the capital Baghdad in the side of Karkh northeast of Baghdad within the coordinates (331924N-442239E).

Five replicates were collected environmental sample for each study site from Soil, Air and dominant Plants in the sites had a long period of years to grow plant samples (*Eucalyptus camaldulensis)*

2.3.2: Environmental Sampling and Preparation:

The samples were collected from the study areas during October in 2019 were taken for each site samples of the plant, surrounding soil and air five replicate samples of each plant leaf were collected, then rinsed thoroughly with deionized water and dried outdoors at room temperature for 3-5 days, then grinded with a mill and sifted with a 1 mm diameter sieve to be ready for analysis. The total samples of the sites were 60 plant samples (USEPA, 2012).

Five replicates soil samples were collected using clean polyethylene bags from a depth of (10-15) cm from random locations within each studied area and dried in the open air at room temperature for 5-7 days and then grinded by the mill (Planetary Ball Mill) and sifted with a 1 mm diameter sieve to be ready for analysis. The total samples of the sites were 20 soil samples (USEPA, 2012).

Active air samples were calculated PAH monitoring data by XAD-4 filter used its higher capacity from increased pore volume and at least twice the surface area according (APHA, 2005) and based measurements are 24 h integrated collections using an Environmental high volume air sampler. The sampler instrument must be on high one meter to prevent the dust dispersion from the earth and putting the filters before started the sampling in oven under (60 C) to one o'clock time to removal from the humidity, and weighting it. The concentrations of PAH are determinate by the analysis of suspended particles after digestion of filter paper. The total samples of the sites were 20 Air samples.

2.2. Analysis of the samples or the analytical:

The samples were diluted 1:1 with 0.2% (v/v) HNO3 from the standard solutions, which had previously been prepared by Top Wave, before centrifuging them for 20 minutes at 2 000 rpm. All sample vials, sample cups, and glassware were cleaned before use by soaking in 10% (v/v) HNO3 and raising with de-ionized water. The appropriate standards for each element were developed within the range of concentrations of the elements in the samples. The results were obtained using three duplicate measurements. Gas moving through a high energy field, which ionizes the gas and significantly heats it, creates an argon plasma. An ICP-ES operated by nebulizing a liquid mist and injecting it into the plasma's core. The sample mist enters the plasma at temperatures that reach, most chemical compounds dissociate as a result of the

intense heat, and the atoms' energy absorption results in excitation and ionization energy transitions. The excited elements' specific spectral emissions are produced by these transitions, the spectral lines into concentrations for a predetermined set of elements after the ICP-ES spectrometer divides the spectra produced by the plasma into distinct spectral lines. ICP-ES has a broad linear range of 4-6 orders of magnitude for the majority of elements. This suggests that a variety of concentrations in samples can be accommodated with fewer dilutions. The outcomes of analytical work are evaluated all at once through the use of a computer program called smart analyzer. Results are displayed in units of mg/dm3 (ppm). In order to calculate the mean, standard deviation (SD), and relative standard deviation (RSD%) of the parallel results for the heavy metals Pb, Cu,Cri) (WHO, 2013).

2.2.4: Pollution Threshold Limit (PTL).

For these different elements, relative proximity (RP) was used to thoroughly compare the raw data from XRF versus ICP-ES. Because RP only considers samples with values higher than the controlled threshold limit, monitoring is necessary (PTL). As shown in Equation, to determine the RP, divide the total number of detected XRF results over the PTL by the total number of detected field samples of ICP-ES results (APHA, 1998):

$$RP = \frac{No.ICPES}{No.XRF}$$

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2.2.5: Estimation of relative water content in leaf tissue:

The relative water content of plant leaves was estimated by taking a fresh plant leaf, weighing it, and then transporting it to a Petri dish containing distilled water and left to float until saturation (for 24 hours), after which it is weighed once to find out the swelling weight, then the leaves are dried using an electric oven at 70 °C (for a period of 24 hours) and to find out the relative water content, we apply the following equation according to the method (Turner,C. 1981).

$$\text{Relative water content (\%)} = \frac{\text{fresh weight} - \text{dry weight}}{\text{full weight} - \text{dry weight}} \times 100$$

2.2.6 :Determination of the amino acid proline in paper tissues.

The concentration of the amino acid proline in the leaves of the five plants taken from the study sites as mentioned in (Scalenghe,etal 2010) using a spectrophotometer at a wavelength of (520) nanometers.

2.2.7:Estimation of the degree of stability of cytoplasmic membranes and leaching of ions:

The degree of stability of the cytoplasmic membranes and the percentage of damage index then it was done by electrical conductivity of leaf cut infiltrates with a device Autoclave period, and then the paper tissues were killed by placing them in the sterilization device . The electrical conductivity of the filters was re-measured and estimated at 15˚ minutes, after cooling them to a temperature of (25) C damage evidence ratio according to equation and as follows:

$$I= [1- (1- T1/T2) / (1- C1/C2)] x 100\%$$

The reading represents the electrical conductivity of a control treatment before and after tissue killing. C and 2 C1. The reading represents the electrical conductivity of each treatment before and after tissue killing, respectively. T and 2 T1. Flame, sodium and potassium ions were also determined for the leaching of the leaf anatomy apparatus.

3. Results and Discussion

Interpretation of the Elements Results elements (Pb,Cr,Cu) by PTL the permissible exposure level for pollutants in Table from comparisons between XRF and ICPES Qualitative and Quantitative in Soil Samples as one of the most crucial indicators for tracking body decomposition and the extent of its accumulation for short-term and long-term . The regression lines for the XRF value and ICPES value for these elements are shown in Figure, in contrast. The regression lines provide a description of the minimized.

The following table analyzes the distance between the line and the data points of each method that demonstrates how well the slope of regression indicates that the results from XRF measurements and ICPES experiments are identical. The interpretation of the monitoring results for the elements and their accumulation can be guided by the screening test of high values when selecting sampling locations. Only samples with values above the controlled threshold limit over the pollution threshold limit are taken into account by (PTL), As a result, the RP is determined by dividing the total number of detected results over the PTL by the total number of ICPES of XRF results, as shown in the following table. Their regression lines' general evaluations were used to carry out the thorough interpretation. Based on the outcomes and as shown in the tables, the fate of these elements in the soil can be explained in the following ways:

Element (Cr) : Only the values over the PTL then 26% of the data exist in close proximity to each other, according to the result of this element in pollution sites samples, which demonstrates the sensitivity and accuracy of factors and approximately and converging parallel these soil samples have a linear regression slope of 0.027. Because of the type of soil and the highest bioavailability of pollution threshold limit, very

few soil analyses are conducted, which is an indicator of the soil's quality (Tudor, *et al* 2013; Schneider, *et al.* 2015).

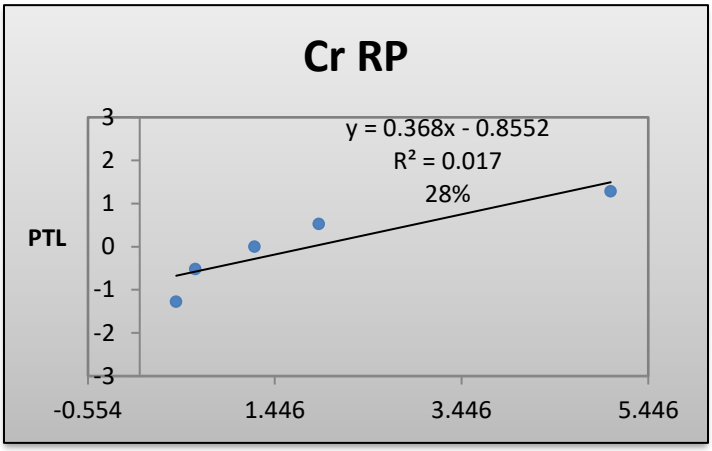

Figure (3-2) The maximum percentage of Cr that is bioavailable due to pollution

Element lead (Pb): Results showed good accuracy in identifying this element. The areas appear to have low concentrations of lead and an accumulation of tetraethyl lead from the traffic congestion in this area because most people visit cemeteries to pay their respects, giving Pb a very low potential for interference from other factors. This shows that there is air pollution in the area and has nothing to do with bioavailability. Due to controlling only the values over the PTL, the information above has high screened measurement values that indicate a high level of reliability. Additionally, 10% of the data are positioned in close proximity to one another (3-2) R2 value is 0.93 , this agree (Fistola, 2011; Schneider, *et al.* 2015).

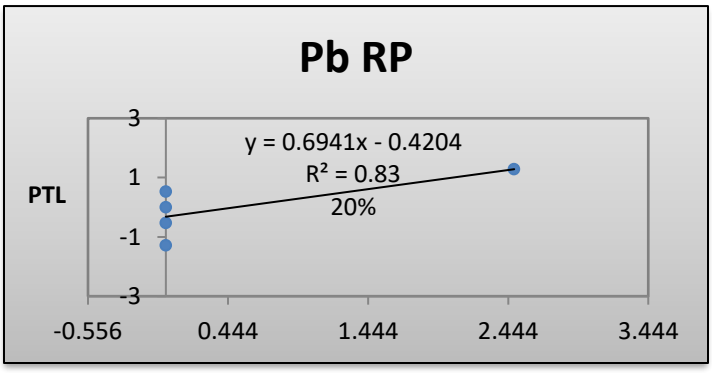

Figure (3-24) The maximum percentage of Cd that is bioavailable due to pollution.

Element (Cu): There is no significant relationship and percentage of plant uptake normal conditions and under the influence of the type of accident becomes somewhat non-existent, and the majority of cadmium is either a feeder or compensated in the composition of the analyses to repair the damage, so there is no significant relationship and percentage of plant uptake element low in abundance to some extent this agree with (Peluso, *et al.* 2006; Larkin, 2011). The RP is only 5 % (3-3) show the regression R2 value of 0.011.

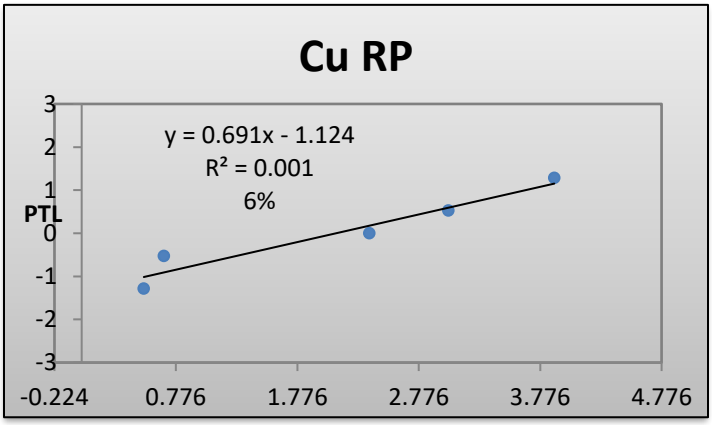

Figure (3-3) The maximum percentage of Cu that is bioavailable due to pollution.

4. Conclusion

Standard analytical methods identified by ICPES give a bioavailability of elements in soil that is highest in areas exposed to control elements, where an indicator of activity in cemeteries, whereas the lead element was higher in the vicinity to the movement of cars in cemetery, where there was an abundance of vitality for this element. PTL expressed by relative proximity (RP), which is a result of the ICPES data, is used in combination with XRF to provide a clear view of the samples and facilitate analysis. The findings demonstrate that there is a large and 27.801 percent decrease in the water content of the leaf tissues of the plants that were exposed to pollution due to the heavy element contamination of the soils. The water content of plant leaves significantly decreased. This decline may be explained by the rising levels of heavy metals in the research area's soil, which, due to their natural characteristics, cause protoplasm to be lost and subsequently influence various metabolic processes as well as lead heavy elements. This causes the water potential to tighten and drop, which in turn causes the plant's water content to drop. Moreover, the walls of the vascular bundles may be destroyed by large quantities of heavy metals and the presence of heavy elements, the difference in osmotic potential as a result of its impact on the absorption and growth of the roots, and the occurrence of change in the components of the wood, which affects the process of transporting water inside the plant. These factors also affect the amount of water in the tissues of the plant. Regarding the impact of regions, it was discovered that the plants in this region had much higher levels of proline in their leaf tissues than those in the other regions, with a value of 68.644 and superior significant development in the researched feature. The concentration of heavy metals in proline content in leaf tissues for plants reached 8.876 mg/gm of the weight of the wet matter, and this may be due to the rise in the concentration of heavy elements in the soil and water of the study area, which causes changes in the various metabolic processes within the plant cell and subsequently affects the concentration. Its effect is clear on some physiological processes.

Proline in the plant, and the cause may also be ascribed to the emergence of water stress as a result of the acceleration of transpiration or because the roots of plants grown in these soils are inhibited, which causes a flaw in the Air. The quantity of proline rises as a result of stopping the cellular distribution that helps to create and oxidize proline as well as boost enzymatic activity for protein hydrolytic enzymes. Protein synthesis, the breakdown of pre-existing proteins, changes in the concentration of particular enzymes, or all of these factors can affect the generation of proteins.

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