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BIOMARKERS OF THE ECOSYSTEM IN LEAD (PB) POLLUTED AREAS OF BAGHDAD CITY, IRAQ

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Abstract

From five major sites in Baghdad, samples of two types of plants and the surrounding soil were collected for the purpose of identifying vital signs and showing them in nature, the more intensive sampling to represent the spatial distribution of the risks of other elements in all Baghdad areas and focus on working spatial information about the idea of the relative risk between variables in environmental and biological factors in the food web. Results showed the presence of lead concentration in all plants but differ from one to other depending on the ability to absorb this element and content the terrestrial dominate plants species. Consecutively *Eucalyptus camaldulensis, Ziziphus spina-christi*, that means using it as a positive indicator of pollution, the distribution of this lead in all station area under this study showed a much greater accumulation in soil response pollution indices can be used to compare different pollution in sites and essential to understanding the current risks to all organism in region. The capacity to absorb and identify the elements in health risks according to Potential Ecological Risk Index (RI) and potential ecological risk factor (Tin) in dynamic modeling to predict changes in Pb concentration in environmental compartments exposure in response to reductions by calculating the concentration of the metal in the sample and its concentration in the reference value.

Key words: Biomarkers, Lead, Ecosystem.

Introduction

Biomarkers in Environmental assessment concentrate mainly on the relationships between the division of toxic matter in the environment and the potential risks of pollutants. However, in past decades, risk assessment levels of pollutants in the environment have not been considered credible because different pollutants can mutually influence their toxic behaviors. Basic main pollutants and chemicals components have a tendency to stick to the environment such as cadmium, lead, mercury or copper, polycyclic aromatic hydrocarbons (PAHs) and others. Minerals in the biotic environment originate from two separate sources of geological processes related to metal fillings geological formations and human resources. Primary contaminants cannot be degraded more so they can undergo different reversible changes in belonging depending on the chemical environment (Campbell *et al*., 2006). Many elements are necessary for life functions (Mertz, 1981), plants and animals possess different mechanisms for accumulating sufficient amounts of elements from their environment also facilitate the treatment of non-essential minerals (Ballatori, 2002; Zalups and Ahmad, 2003). Treatment and retention of metals (or any other chemical), environmental pollution and the effects of chemicals on the environment and natural resources have become one of the major global problems (Burger and Gochfeld, 2009).

Biomarkers can be defined as a change in biological response such as ranging from molecular to cellular and physiological responses to behavioral changes that can be associated with exposure to toxic chemicals or their toxic effects (Peakall, 1994). Van Gestel and Van Brummelen, (1996) defined the biomarker as any biological response to an individual environmental chemical, measured within an organism or in its products (urine, feces, blood, hair, feathers, etc.), indicating a deviation from the natural state Can be detected in the intact organism. When biological responses are measured

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using whole organisms, Van Gestel and Van Brummelen (1996), unlike most other organisms, refer to biomarkers rather than biomarkers. Although most of the biomarkers measured at the molecular level according to tissue levels, the WHO definition, (2001) is preferred because it does not focus on a specific integration level. To understand the concept of biomarkers in integrated ecosystems, the important goals that identify the changes that had happened in the environmental areas from various sites were chosen from Baghdad by implementation of ecological model Biomarkers of Lead occurs within environmental factors (Soil, Plants) and use of biomarkers in monitoring programs, while considering the possible ways to improve the effectiveness and usefulness of biomarker-based monitoring programs.

Materials and Methods

Collection samples

Five replicates were collected environmental sample for each study site from Soil and dominant Plants in the sites had a long period of years to grow plant samples *(Eucalyptus camaldulensis, Ziziphus spina-christi*) samples were collected during October, 2019.

Environmental Samples:

• Soil Samples: Were collected by using cleaned polyethylene bags from 30 cm in depth to preparation of soil samples by five replications of each region to get final 25 samples (Yang *et al*., 2008).

• Plant Samples: Plant leaves samples have collected and then rinsed thoroughly with deionized water and dried in the outdoor in room temperature for (3-5) days then ground with a grinder to be ready before analysis,plants was *Eucalyptus camaldulensis, Ziziphus spina-christi)*

Sample Preparation for Analysis by Top Wave

Determination the presence of pb Element by using Atomic spectrometer contra 700 type and has been examined in the Ministry of Commerce/General Company for Foodstuff Trading / quality control division. This method identifies the concentration of pb in (soil and plants) and their replication every kind have 5 replication.

• In soil samples: Weight 3.5 to 4.0g of the samples to the digestion vessel. The amount of organic material should not exceed 250mg, add 2.5ml of HNO_3 65% and 7.5ml of HCl 37% to the samples. And used Method of dilution to analyses of water samples (APHA, 2005).

• In plant: Weight 0.03g of samples and place them in the digestion vessels and add 7.5 ml of nitric acid HNO_3 65%, after that shake the mixture carefully or stir with clean glass bar. Necessary wait at least 2min before the vessel is closed, Heat in the Microwave oven with the following program to avoid foaming and splashing wait until the vessels have cooled the same room temperature about (20 min). The digestion vessel is carefully opened in fume hood wearing hand Eye and body protection since a large amount of gas would be produced during the digestion process, then they were quantitatively transferred to Falcon tubes and diluted to 15 ml with deionized water, calibration blanks of 2.0 mL deionized water are taken through the same digestion process (APHA, 2005).

After digestion samples the heavy metal are measured by using AAS instruments Atomic absorption spectrometer AAS (Ministry of Commerce / General Company for Foodstuff Trading / quality control division).

Determination oF the potential environmental risk factor (RI) for samples

This is achieved by determination the CRM (Certificate References Materials) of samples used.

@Certified value ± 95% confidence interval of the mean value

c Mean ± standard deviation at 95% confidence limit for N = 3 replicate Then apply the equation below:

RI = Tin × CRM / Cio

Statistical method

The analysis of variance (ANOVA) using a complete randomized design (CRD) was employed to test the differences between the eight date palm residues and *A. tortillas* in all the measured properties using the SAS statistical package Cox, D.R. (2006). Least significant difference at 5% level of probability (LSD 0.05) was used to detect the differences among the means of all the measured properties. Correlation analysis was also carried out to find out the relationship between the heating value and each of the chemical constituents and ultimate and proximate analysis of the date palm residues (Cox, 2006).

Results and Discussion

Lead in types of Plants

Results showed the presence of lead concentration in all plants but differ from one to other depending on the ability to absorb this element and content the terrestrial dominate plants species, Consecutively *Eucalyptus camaldulensis, Ziziphus spina-christi),* that means using it as a positive indicator of pollution in study areas in this area. Through statistical analysis scored a significance between element and plants in a percentage of the corresponding (30%, 19%) respectively, this is consistent with some of the researchers in local studied found Pb in *Phoenix dactylifera* between (2.3-1.9 ppm) and in local

Table 1: CRM (Certificate References Materials) Elements CRM". www.crunchbase.com. Retrieved 2017.

Samples	CRM of Pb
Soil	2.81 ± 0.12
Plants	0.52 ± 0.01

study by through the average results of plants that have been obtained there is a relationship between plants with a difference from one to other depending on the ability to absorb Lead.

This biomarker that plants are known in accumulating metals from around its environment (Al-Haidary, 2009 and Ajmi, 2010).

lead in Soil

After obtaining the results of lead concentration in soil in this study area there were no significant correlation P-Value (0.03). It was not of a critical level set by WHO and EUO (UNEP, 2009). Most concentrations were P-value < 0.05 and percentage 9% in lead compared to some researchers reported (Houserova *et al*., 2007; Ullrich *et al*., 2007). Table 2, Showed Table concentration of lead in Soil.

The distribution of this lead in all station area under this study showed a much greater accumulation in Soil response pollution indices can be used to compare different pollution in sites and essential to understanding the current risks to all organism in region especially when there spatial database for the distribution of pollutants such as lead with the rapid development of urbanization and industrialization and soil pollution for the dominant organism dominate in area and agree with the study. That's mean depending on different physical characters, structure and quality of nutrition.

This refers to a good biomarker of control lead in soil essential to understand the current potential environmental risks index to consumers and quality, potentially producing very high and toxic concentrations in upper-trophic-level species (Gobas *et al*; 2009). This study agrees with researchers (Stewart *et al*., 2008; Ajmi, 2010).

Table 2: The concentration of lead in Soil.

Pond location	Mean Soil Pb
1	0.08
2	0.05
3	0.06
4	0.05
5	0.92
Mean	0.23
SD	0.39
LSD	1.028
P *value*	0.012
Variance	0.118

Table 3: Factors and measures of potential ecological risk factor (RI) (Katie and Pendias, 2006).

RI value	Grades of the environment
RI < 110	Low risk
110 ≤ RI < 200	Moderate risk
200 ≤ RI < 400	Considerable risk
400 ≤ RI	Very high risk

From our results showed the capacity to absorb and identify the elements in health risks according to Potential Ecological Risk Index (RI) and potential ecological risk factor (Tin) in dynamic modeling to predict changes in Pb concentration in environmental compartments exposure in response to reductions by calculating the concentration of the metal in the sample and its concentration in the reference value. Average values to predicate for more than < ten years depending Exposure Factors.

Average high values to predicate less than > ten years depending Exposure Factors:

RI = Tin × CRM / Cio

Tin = Concentration of metals in the sample Cio = reference depending

Coclusion

It is the first comprehensive field study of biomarker for this region Except the study of (Abd Ali, 2015), the accumulation of elements and physical and chemical statistical analyses were using to evaluate lead which variables correlated in types plants and estimate with the different area and detect types of plant uptake of these elements as amenability that a marker an important environmental pollution in the region. The balance amount of essential has a key role in the metabolism of a food chain. Demonstrates relationship for most plants to absorb the element and most portability tolerant pollution. Most plants play an important role in circulating nutrients and trace metals in aquatic ecosystems, spread all over the world due to their high capacity in uptake of nutrients and other pollutants from water are proper for wastewater treatment and reduce pollution loadings in the aquatic environment (Brancovic *et al*., 2010) Uptake of in organic complexes by aquatic plants is because of their higher surface area compare to their volume and high membrane sorption and permanent contacts to solutions applied for monitoring of pollutants and the investigation of ecosystem quality of water bodies

The results showed that the percentage of pollution is few, but compared with the study more and this indicate that the region is vulnerable to pollution in the coming years. Through the results of the lead concentration that

have been obtained from analyzed samples were reached of the bioindication environmental and how to transition in aquatic food chains.

Recommendation

Strongly support the more intensive sampling to represent the spatial distribution of the risks of other elements in all Baghdad areas and focus on working spatial information about the idea of the relative risk between variables in environmental and biological factors in the food web by other new technologies such as Telescope and Remote Sensing to get a whole integrated database and allows users to evaluate potential policy options and poses better questions to decision makers seeking to protect susceptible populations community.

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