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Assesement of Some Heavy Metals in Soil Samples Collected From Selected Cemeteries in Kano Metropolis-Nigeria

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ABSTRACT: This study evaluated the level of different heavy metals namely Lead (Pb), Nickel (Ni) and Manganese (Mn) pollution in soil samples from selected cemeteries within Kano metropolitan. The identified soil type were sampled using stainless steel soil auger to collect core samples at a 15cm soil depths for each soil samples, 5 core samples randomly taken were homogenized in a clean plastic bucket and composited and the representative soil samples was taken to the laboratory for digestion, $10cm^3$ of 1:3 ratio of HNO_3 and HCl was added to 2.0g portion of the soil sample on a hot plate. The contents of the beaker were heated at 200℃ for 1 hr in a fuming hood and later cooled to room temperature. After the cooling, $20cm^3$ of distilled water was added in to the mixture and filtered using filter paper No.1 (11 cm) to complete the digestion. The mixture was then allowed to settle and then taken for analysis. Microwave plasma Atomic Emission spectrophotometer (MP-AES) technique was used to analyze the concentrations of the metals. The results obtained showed that the range of [Pb] (0.01 to 0.82mg/kg) [Mn] (0.33 to 1.31mg/kg) [Ni] (0.9 to 0.17mg/kg) for the soil samples. The results obtained were compared with the maximum permissible limits set by WHO/FAO. The study revealed the concentrations of the heavy metals obtained in levels that are within and above the tolerable limit for human consumption, though there are some that were below the permissible limits but long exposure to those metals might bring about bioaccumulation and turn out to be damaging to the health of the individual. However the result of this study shows that Ni, and Pb were found to exceed World Health Organization permissible limits.

Key words: Heavy metals,Cemetery, soil,kano, Nigeria,MP-AES

I. INTRODUCTION

Heavy metals are generally refer to those metals which poses a specific density of more than $5g/cm^3$and adversely affects the environment and living organism [15]

A heavy metal is not toxic unless when its concentration in the plants and animal exceeds a certain level that is required, some elements called trace elements or micro nutrients, have essential function in plants and animal cell this has been shown for Co, Cu, Fe, Mn, Cd and Ni, only when the internal concentration exceeds a certain threshold level they demonstrate toxic effects and then they are commonly termed heavy metals [16] Heavy metals are significant environmental pollutants and their toxicity is the problem of increasing significance for ecological, evolutionary, nutritional and the environmental reasons [14]

Heavy metals are one of the important types of contaminants that can be found on the fruit and in the tissue of the Tree plants. The prolonged human consumption of unsafe concentration of heavy metals in food stuffs may lead to the disruption of numerous biological and biochemical processes in the human body. Trees grown in heavy metal contaminated soils accumulate higher amounts of metals than do those grown in uncontaminated soil because they absorb these metals through their root or leaves [2]

Cemetery is a place of deposit and transformation of the dead bodies without dangers for the public health and environment [7].Cemeteries consist of an important urban equipment employed since the old age by society for the deposition of the dead[10] However, few actions are taken to mitigate the environmental impact generated by urban cemeteries, one of the main consequences of the implementation of these

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spaces in urban and rural areas is soil contamination by heavy metals released from bodies in decomposition that affects the surrounding environment or population directly [21] Plants and animal take up metal from the soil and concentrate them, some of these metals like copper (Cu), Iron (Fe), Manganese (Mn), Nickel (Ni), Cobalt (Co) are essential in low concentration for the survival of all forms of life and are describe as essential trace elements. When present in greater quantities the heavy metals like lead and cadmium may cause metabolic anomalies [5] The Study of cemetery in relation to heavy metals highlight the importance of developing research to discuss its configuration, morphology and urban regional and environmental impacts [18]

II. MATERIALS AND METHODS

In the preparation of reagents, chemical of analytical grade purity and distilled water were used. All the glass and plastic wares were washed with liquid detergent and rinsed with distilled water before drying in an oven at 105^0C. All the weighing were done on FA2004 model of analytical weighing balance and analysis of the metals was carried out using Agilent Microwave Plasma Atomic Emission Spectroscopy (MP-AES) Model 4210.

Area Description

Location

Kano is the state capital of Kano State in north western part of Nigeria. The city is one of the largest and most populous city in Nigeria (Latitude $12^0 2^{'}$N, Longitude $08^0 30^{'}$E).(Fig.1).The population of the city is estimated at over 10million during the 2006 national population census [12]

Table 1: The sampling locations of selected cemeteries within Kano metropolitan and their codes.

S / N	Cemetery Locations			Code
1	Hajj-Camp cemetery	H	C	C
2	Kanzu Cemetery	K	Z	C
3	Kofar-Mazugal Cemetery	K	M	C
4	Kuka-Bulukiya Cemetery	K	B	C
5	Sharada Cemetery	S	C	C

Sample Collection

To evaluate the variability between soils and plant of different cemeteries 100 samples were collected. A composite sampling were adopted to obtain a true representation, samples of soil were taken from each cemetery at designated distance of 50m from each other at a five sampling spot at each cemetery at 15cm depth.

The identified soil type were sampled using stainless steel soil auger to collect core samples at a 15cm soil depths for each soil series, 5 core samples randomly taken were homogenized in a clean plastic bucket and composited and the representative soil samples was taken to the laboratory, air dried, crushed and sieved using 2mm mesh. The samples were kept in an air tight plastic container and labeled accordingly and stored in a refrigerator in order to lower any microbial activities and to slow down the rate of chemical reactions [1,13]

Sample Preparations

2.0g portion of each finely ground soil samples were weighed separately into a $250cm^3$Pyrex beaker and $10cm^3$ of 1:3 ratio of HNO_3 and HCl was added .The mixture was digested on hot plate until a clear solution was obtained, the beaker was then allowed to cooled and content was then diluted with $20cm^3$ distilled water in $50cm^3$ volumetric flask [8]. Blank solution was also made [1,13] The solution was used to analyze for Cadmium, Cobalt, Chromium and Copper using Microwave Plasma Atomic Emission Spectroscopy (MP-AES) Agilent 4210 Model.

Data Analysis

The statistical analysis of all data was conducted using SPSS software (version 20.0). One way ANOVA was used to determine the significance difference of the elements in the samples at $P < 0.05$ significance level.

III. RESULTS AND DISCUSSIONS

The present study reports the heavy metal content (Pb Ni, and Mn) in soil and plant samples collected from some cemetery located within Kano metropolitan, Kano State, Nigeria. The observed concentrations ofPb Ni, and Mnin the soil samples were compared with the recommended limits as established by the FAO/WHO (2012)

The mean concentrations and range of heavy metals found in the soil samples collected from the five (5) selected cemeteries are presented in table 2

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Table 2:Meanconcentrations of heavy metals in the soil samples analyzed (mg/kg)

Sites	Pb	Mn	Ni
HCC	0.24±0.29	0.78±0.75	0.15±0.9
KMC	0.25±0.33	0.77±0.43	0.13±0.16
KZC	0.24±0.38	0.93±1.0	0.10±0.15
KBC	0.18±0.19	1.31±1.30	0.17±0.15
SC	0.20±0.19	0.76±0.23	0.09±0.65
WHO/FAO2012	1	00	20 . 1

Table 3: ANOVA for the mean concentration of heavy metals in the soil samples analyzed (mg/kg)

Element (mg/l)	HCC	KMC	KZC	KBC	SC
Pb	0.24±0.29a	0.25±0.33b	0.24±0.38c	0.18±0.19d	0.20±0.19e
Mn	0.78±0.75a	0.77±0.43a	0.93±1.0a	1.31±1.30a	0.76±0.23a
Ni	0.15±0.9a	0.13±0.16a	0.10±0.15a	0.17±0.15a	0.09±0.65a

Mean ± standard deviation with different letters in the same row is significantly different at P< 0.05

IV. DISCUSSION

Lead (Pb)

From Table 2, lead in soil samples analyzed in this study was in the range of 0.03mg/kg to 0.82mg/kg. The result of this study revealed that the mean concentrations of lead detected in all the sampling locations were all below the WHO/FAO,(2012) maximum permissible limit of Pb 10mg/kg.These values are in agreement with the concentrations of lead reported by Turner et al., (2011) who reported the concentration of lead in the soil ranging from 0.32mg/kg to 1.23mg/kg and Lawal,(2017) assessed the level of lead (Pb) in soil where he reported the values of Pb ranging from 0.46mg/kg to 2.93mg/kg, which is also below the permissible limit of WHO/FAO,(2012).This can be attributed to the low availability of lead content in the dead human after decomposition which is eventually leached into the underlying soils [4].Statistically there is a significant difference across the sampling areas at ($p<0.05$)

Nickel (Ni)

Nickel (Ni) is another heavy metal which is toxic, carcinogenic and dangerous to humans, plants and animals. The Ni released into the soil from copper-nickel smelters, burning of diesel oil containing Ni, city effluent, bio solid, impurities in fertilizers, mining and smelting. It enters into the soil environment through anthropogenic activities although small quantities are released during weathering of parent material [19].Nickel concentration in the soil were generally below the standard limit set by WHO/FAO,(2012). This implies that the soil is safe from adverse effects related to high concentration of Ni.The concentration of Nickel reported in this study ranges from 0.8mg/kg to 0.17mg/kg (Table 2). The result obtained in this study shows that the concentration of (Ni) in soil samples analyzed from all the sampling sites were below the permissible limits of (Ni) 35mg/kg set by FAO/WHO,(2012). Li et al.,.(2009) reported the (Ni) concentration in soils of Hong Kong by AAS. Nickel was found to be below the permissible limits set by FAO/WHO,(2012) on the other hand, Saleem et al.(2005) reported the concentrations of (Ni) in soil ranges from 0.92mg/kg to 1.57 mg/kg which is also below the international standard limit of WHO/FAO,(2012).Nickel, although a micronutrient to most organisms, is known to be carcinogenic when consumed in excessive quantities [6]. The source of nickel pollution is the air born effluent from industrial units using nickel carbonyl ($NiCO_4$)$_4$, it's several times more toxic than CO_2. The complexes breaks down and deposits finely divided Ni in the lungs, which can cause cancers [3] Initial symptoms of toxicity due to nickel carbonyl are nausea, dizziness, headache, chest pain etc [11].Statistical analysis of variance (ANOVA) Shows no significant difference across all the sampling areas at ($p<0.05$)

Mananese (Mn)

Manganese is a very essential trace element for plants and animals growth. Its deficiency produces severe skeletal and reproductive abnormalities in mammals. High concentration of manganese (Mn) causes hazardous effects on lungs and brains of humans [15]

Manganese mean concentration in the soil samples analyzed was in the range of 0.4mg/kg to 0.93mg/kg as seen in(Table 2).The accumulation of Manganese in soil appears to be below the maximum permissible limit of Mn of 2.0mg/kg by WHO/FAO,(2012).This result is lower compared to the findings of Ghulam,et al,(2015) where they reported the concentration of manganese in soil

from their study of heavy metals (Mn,Pb,As,Ni) accumulation in the soil from different locations as 0.00 to 1.25mg/kg 1.11 to 2.29mg/kg and 1.51 to 3.96mg/kg respectively..Statistical analysis shows that there is no significant difference to all the samples analyzed at ($p<0.05$)

V. CONCLUSSION

This study presents the concentrations of heavy metals pollutants in soil from selected cemeteries in Kano metropolitan. The study revealed the concentrations of the heavy metals determined in levels that are within and above the tolerable limit for human consumption, though there are some that are below the permissible limits but long exposure to those metals might bring about bioaccumulation and turn out to be damaging to the health of the individual. The results of heavy metals obtained from the analysis of soil samples from five (5) selected cemeteries of Kano metropolitan indicated that their concentrations are relatively low while some were higher than the permissible limit of FAO/WHO,(2002).The low concentration could be as a result of the minimum content of these metals due to the activities that were taking place around the particular cemeterial areas because plants take up heavy metals by absorbing them from airborne deposits on the parts of the plants exposed to the air from the polluted environments as well as from contaminated soils through root systems.

Ni enters environment from different sources runoff and leached into groundwater, fossil-fuel combustion, mineral leaching, and emission from nearby highways, motor mechanic workshops, factories and motorist could also lead to an increase in heavy metal content in the cemeteries. The concentration of the Ni was in the soil of the study area ranging from (0.02 to 0.52mg/kg) which was more than the maximum acceptable limit of Food and Agricultural Organization (FAO, 2012) of 0.1mg/kg. Ni also contained at a very high concentration level in plant of the study area. Ni ranging from (0.8mg/kg to 0.17mg/kg) while the maximum acceptable limit set by the Food and Agricultural Organization (FAO, 2012) is 0.1mg/kg. The toxic effects on plant are unlikely to occur below soil Ni concentrations of (0.1mg/kg)

This study indicated the harmful impacts to the environment and human health from the burial processes and the consequent decomposition of human bodies that occur within the cemeteries.

REFERENCES

[1]. Allinor, J.A (2004).Managing Urban growth in the city of Amman, Jordan (2),93-99

[2]. Aljassir Badr,Mohammed I.Habadi Bandar k.Alamar (2015).Assesing the level of Health literacy among adult visistors in the primary care sittings of functional guard Health affairs Jeddah. Saudi Arabia. Journal of Health sciences (3):120-128

[3]. Bencko,(1983).Trace elements in the human scalp,hair and finger nail as affected by infection with (Sochistosoma mansoni). Journal of radiation physics and Chemistry.Vol 45,(1):141-145

[4]. Bradford,G.R. L.J. Lund and W. Olmstead (1975). Trace elements concentrations of sewage treatment plant effluents and sludge: their interactions with soil and uptake by plants J. Environ. Qual, 4, 123-127

[5]. Codex.Alimentarius (FAO/WHO,2012).Food additive and contaminant.Joint FAO/WHO Food standard programme, Alinorm 01/12A,1-2892001

[6]. Duffus, J.H (2002).Heavy metals"A meaningless term Clinical chemistry section, commission on toxicology. Pure Appl. Chem. 2002, 74, 793–807.

[7]. Fogli D,(2004). Techniques of decomposition of Bodies Adopted in Cemeteries and Their Relations with the Environment, available at http:// 6.71.151.103/effs/docs/shangai_ıng.pdf

[8]. Funtua,M.A; Abaji,E.B and Ajibola V.O (2008).Assessment of the heavy metal contents of Spinach and Lattuce grown along the Bank of River Getsi, Kano.Journal of Chemical Society of Nig(5)1,Pp11-14

[9]. Ghulam Farid (2015).Heavy metal (Cd,Ni and Pb) contamination of soil and plant in madina town of Faisalbad metropolitan. Journal of Advance crop science Technology(4:1)http//dx.doi.org/10.4172/2329-8863

[10]. Goelner,(2015).Dependent and independent mismatch repaire DNA Repaire (AMST) 32:24

[11]. Hawkes, H. E.and Webb, J. S., 1997.Geochemistry in mineral exploration. New York: Harper and Row. Evolution and human behavior 22 (2001) 113-142

[12]. Idris S.(2006).Population Census, Health and Development. The Companion February 13th 2006 Pp-11

[13]. Iyaka.Y.A (2007).Concentrations of Cu and Zn in some fruits and vegetables commonly available in North central zone of Nigeria,

Electronic journal of environmental agricultural and food chemistry.6(6):2150-2154

[14]. Jaishankar M.Mathew, B.B Shah, M.S and Gowda.KRS (2013). Biosoption of few heavy metal ions using agricultural waste. Journal of Environmental Pollution and Human Health,2(1):1-6

[15]. Jarup L.(2003).Hazards of heavy metals contamination British medical Bulletin 68:Pp-167-182

[16]. Klause.J (2010).Definition of heavy metals and their meaning in biological systems. Journal of manufactured science and engineering. Dec 2010 132(6)060101 (1pages)

[17]. Lawal, F. A., Owoeye, I. D., Udeh, M. U., and Ojo, O. D., (1997.).Effects of discharged industrial pollutant on quality of Challawa River, Soil and Rural Dwellers, NESY, Commissioned Report."

[18]. Li.,X.D.,C.S Poon and P.S Liu (2001) .Heavy metal contamination of urban soil and street dust in Hongkong.Aplied geochem.16:1361-1368

[19]. Saleem., M.S Sadeeq M.U Memon K.S (2005) Heavy metal contamination through industrial effluent to irrigation water and soil in korangi area of Karachi (Pakistan) M.S Agri/Bio 7:646-648

[20]. Turner, R.C (1965).A study of the lime potential research branch department of agriculture, achieved from the original on 9th July 2012.

[21]. Turner, R.C. and Clark J.S.(1966).Lime potential in acid clay and soil suspensions. Trans. Communications II & IV of International Society of Soil Science,208–215.

[22]. Zychowsky,J.(2012).Impact of cemeteries on ground water Chemistry. A Review. 93(10) 2012, Pp-29-37

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