Forms of Labile Metals in the Soil and Their Concentrations in*Amaranthushybridus* from Municipal Dumpsites

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Abstract: *Labile metal pollution in soil consequently affected plants and this threaten the health through food chain. Three major dumpsites in Akure metropolis were analysed for their labile metals concentrations, their forms in the soil and the rate of absorption in green vegetables. Utilization of the soil for agricultural purposes that could influence human health was established. Their Concentrations were determined by Atomic Absorption Spectrophotometer after digestion. The concentration of labile metals evaluated indicatedthatIrese Road Dumpsite had high proportions than other dumpsites except Lead (34.00) in AZ Global Alliance. Speciation of labile metals in the three dumpsites showed higher proportion in the inert fractions. Rate of absorption of labile metals in Vegetable from Irese Road Dumpsite were higher in Zinc (1590.00), Iron (596.90), Nickel (300.00), manganese (149.80) and Cadmium (99.96).The results indicated that plants from dumpsites investigated were hazardous for consumption.*
Keywords: *Accumulation; Contaminants; Labile metals; Pollutant; Toxic.*

I.   Introduction:

Labile metals accumulation in the soil, water and plants most importantly, cadmium, chromium, copper, lead, nickel and zinc causes many hazard to human's health and ecosystem (Amacher, 1996). Labile metals in the surroundings have gone beyond acceptable levels due to human involvement through developmental conducts involving industries and agriculture. These labile metals become noxious and they mount up in soft tissues of animals when they are absorbed in the body through food, water, air or the skin (Murhekar, 2012, Nwajei*et al.,* 2012), Several diseases affecting almost all the vital organs and functions are caused by Labile metal toxicity (Menc*et al.,*1994, Nwajei*et al,.*2012).

In particular, exposure to soil contamination causes great health consequences depending on pollutant type, pathway off attack and susceptibility of the exposed population, lead in particular is hazardous to juvenile where there is a high risk of developmental damage to the brain, and a greater risk in kidney damage to all populace. However, numerous potential contaminants are essential in trace amounts by plants for food production, but they become dangerous when they occur in abundant in the soil (Tokalioglu*et al.*, 2003).

Due to the fact that Metals are indestructible, most of them have toxic effect in living organisms when they accumulate and immiscible concentration levels are exceeded (Mwolawa*et al*., 2011). Aside industrialization, the pollution of soil can also be from exhaust from heavy vehicles along the roadside, this has been confirmed by some researchers (Joshi *et al*., 2010). They realized that the concentration of metals such as lead, copper, zinc and cadmium diminished swiftly within 10 to 50m distance from the roadside.

Increase in human activities, especially with the application of modern technologies, pollution and contamination of the human food chain has become unavoidable. Labile metals absorption by plants grown in polluted soils has been studied to a considerable extent (Wong, 1996; Yusuf and Oluwole, 2003).

Effects of Labile Metals in Living Organisms:

Labile metals are required by living organism in deferent proportions. Iron, Cobalt, Manganese, Molybdenum and Zinc are required in human diet. Toxic effect of all metals is felt at higher concentrations and Excessive levels of these can cause severe harm to the organism. According to Yusuf and Oluwole, 2003, labile metals disrupt metabolic function in two ways:

a).They accumulate and affect the role of important organs in human body such as heart, brain kidney, bone, liver etc.

b).They takes over the activities of important nutrition and minerals from their respective places and thus prevents their biological function in the body. The introductions of these toxic metals into the body are in different ways; this can be traced to ingestion of different food products, household products exposure, individual products and different proportion of industrial products and chemicals (Yusuf and Oluwole, 2003). Labile metal contaminant in vegetables is of great issue because food stuffs are significant components of

human diet. Quality assurance takes cognisance of Labile metal contamination in the food items because of their prominent role in food security (Marshall, 2004; Radwan and Salama, 2006; Wang *et al.*, 2005; Khan *et al.,* 2008). Maximum permissible levels of toxic metals in food items have been set by International and national regulations on food quality to reduced the level of intake and increased the awareness of the risk these metals pose to food chain (Radwan and Salam, 2006).

Labile Metals and Plants:
The allotment of metals between soil and plant is an important issue in assessing environmental effect of labile metals in the vicinity (Abulude and Adesoje, 2006). Labile metal toxicity can inhibit the effect of growth in plant, affect enzymatic, photosynthetic activity and accumulation of other unwanted nutrient elements that can injured or damage the root system (Gune*et al*., 2004). McKone, 1994 stressed that when plants are exposed to labile metals, oxidative stress occurs which leads to cellular injury and also disturbs cellular ionic homeostasis. Chelating mechanism in Plants helps to detoxifyplant from labile metal activities and help to reduce the effect of labile metal exposure. In transpeptidation reaction phytochelations (PCs) are synthesize from reduced glutathione (GSH) which is catalyzed by the enzyme phytochelationsynthase (PCS). During the exposure of plants to labile metals, glutathione is important for PCS synthesis (McKone, 1994).

Labile Metals and the Environment:
Soil is a basic Component of rural and urban environments for settlement and for agricultural practices (Singh *et al*, 2011).Labile metal permissible level in the soil ranges from less than one to as high as 1,000.00 mg/kg. Production of chemicals and the use of synthetic product (e.g. pesticides,plastics, paints, polyethylene, batteries, industrial waste, and land relevance on industrial or domestic sludge) can result in labile metal contamination of urban and agricultural soil. Unwarranted levels of lots of labile metals in soil can degrade its quality, reduce its potency in crop production and may result in poor yield of agricultural products. These can adversely affect animal and human health and disrupt ecosystem. Therefore, it is very compulsory to eradicate the accumulation of labile metals from the environment (Singh *et al*, 2011).

Labile Metals Consumption through Contamination of Vegetable Nutrients:
Exposure to labile metals contamination by plant nutrient during absorption, namely Cadmium (Cd), Lead (Pb), Zinc (Zn), Copper (Cu) has been recognized as a menace to human health when the vegetables are consumed (Sharma *et al.,* 2007). Labile metals have toxic and mutagenic effects even at lower concentration. Numerous cases of human disease, disorders, malfunction and malformation of organs are due to labile metal toxicity as reported by Al-Jassir*et al.,* 2005. Let alone the plants as early discussed, human beings and animals are the receiving ends and are seriously affected by toxic levels of labile metals (Lin *et al*., 2004). Labile metal may emerge as either deposit on the surface of vegetables, or absorbed during nutritional uptake by the crop roots during osmosis and enter into the edible part of plant tissues. Labile metals deposition on the surface of leaves, which are heavier enough to enter through spores can be eliminated simply by washing before consumption, whereas bio-accumulated metals in the leaves are difficult to eliminate and are of major concern (Sharma *et al.*, 2007).

Influence of Labile Metals on Ecosystem:
Lead, arsenic, mercury, cadmium and aluminium are major labile metals constituting the most dangerous toxins in our ecosystem. Many environmental studies nowadays focused on Contaminations of land resources by labile metals(USEPA, 2000). High concentration of labile metals in the municipal solid waste (MSW) has been traced to high concentration of fly ash wish is considered as hazardous material to the environment. Decontamination of MSW fly ash can be achieved by first mixed it with alkali or alkaline earth metal chloride for complete neutralizations (e.g. Calcium chloride) and water. The salt solution is then pelletized and treated in a rotary reactor at about 1000^0C.There are indications that more than 90% of cadmium and lead and about 60% of copper and 80% of zinc could be eliminated by this processas analyzed by USEPA, 2000.

Reflections on some studies of Labile Metals in Vegetables:
Labile metals absorption by plants grown in contaminated soils has been studied to a considerable extent in some areas of the world (Wong, 1996; Yusuf and Oluwole, 2003). It is of no doubt thatvegetables constitute a significant part of the human diet since they contain carbohydrates, proteins, vitamins, minerals and fibres obligatory for human health. They also help to neutralize acidic substances formed during digestion in animal (Tichopoulos*et al*, 1997). As human activities increase, especially with the application of modern technologies, pollution and contamination of the human food chain has become inevitable. Labile metal exposure is not a total modern experience due to its present from time immemorial.Record had shown the

contamination of wine and grape drinks by lead-lined jugs and cooking pots as a contributing factor in the "decline and fall" of the Roman Empire and the Mad Hatter character in Alice in Wonderland(Tichopoulos*et al*, 1997). Modification sets in after mine teeth century when hat maker used mercury to stiffen hat material and frequently became psychotic from mercury toxicity. Human exposure to labile metals has increased considerably in the last 50 years as a result of an exponential increase in the use of labile metal in industrial process and products.

This work aims at determining the concentration of labile metals in various dumpsites in Akure metropolis in Ondo State and the rate of absorption of heavy metals in green vegetable harvested after three weeks of planting, obtained from these dumpsites and the objectives are to determine the concentration of labile metals in various soil samples collected from the sites, to estimate the rate of absorption of labile metals in green vegetables harvested from different dumpsites investigated. The results obtained will be used to evaluate the level of labile metal contamination in the environment and the risk posed on human or poison that may occur by consumption of plant products harvested from these environments.

II. Materials And Methods

Collection of Material:

Soil samples were obtained from different dumpsites (AZ Global Alliance Nig Ltd Dumpsite, Olajide Camp Dumpsite and Irese Road Dumpsite) in Akure town, Akure South local government area of Ondo State as indicated in fig. 1 and figs. 2, 3 and 4 showed the pictures of the dumpsites. Akure had geographical location of latitude $7^0 25^1$ and longitude $5^0 19^1$ of the meridian and it is situated at elevation of 353 meters above the sea level. Akure has the largest population of 420,594 making it the biggest city in Ondo State, Nigeria. The green vegetable (*Amaranthushybridus*) seeds were purchased from king's market in the same town in Ondo state.

The samples from the studied sites in Akure were collected and brought to Analytical research laboratory in Rufus Giwa Polytechnic, Owo and analyzed for the total concentration of Labile metals, forms at which the metals exist and the rate of absorption in green vegetables after three weeks of growth.
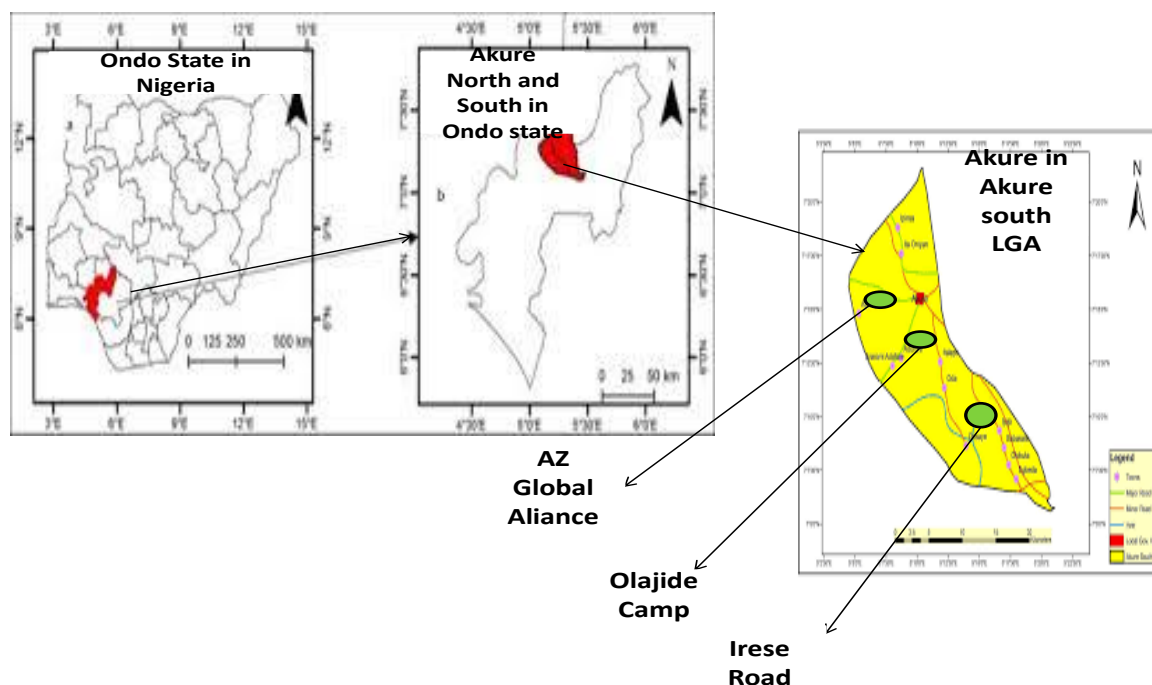

Fig. 1, Map of the Dumpsites in Akure, Ondo State

Fig. 2, AZ Dumpsite   Fig. 3, Lajide Dumpsite   Fig. 4, Irese road dumpsite

Preparation of Soil and Plant Samples:
Soil samples were manually dug from different point source by random sampling method in the site and kept inside a clean five litter buckets. Green vegetables were planted at the different point source after minor clearing for easy germination and harvested after three weeks. Both the soil and the vegetable were oven dried at 105^0C in thermosetting oven. The vegetable samples were reduced to fine powder with the aid of a mechanical grinder to pass through 40 mesh sieves to increase the surface area for proper analysis. The milled powder samples were collected and stored in glass jars, tightly covered and kept for analysis.

Determination of Mineral Composition:
A O A C 2000 was followed for proper digestion of dried soil and green vegetable samples. Sequential extraction of different forms of labile metals helps in quantifying the fractions in different phases as explained by (Tessier*et al*., 1985). These were made up to $100cm^3$ mark with distilled water. The absorbance of the sample solutions were read by already standardize Atomic Absorption Spectrophotometer with appropriate lamp for the required metals.

Labile Metal Speciation:
Forms of labile metals (fractionation):   The procedure of Tessier*et al.,* (1985) was selected for this study. In this method, labile metals are separated into five operational defined fractions: exchangeable fraction, bound to carbonates, bound to iron and manganese oxide, bound to organic matter and residual fraction. The sequential extraction is as follows:
Step I, Exchangeable fraction: Following Tessier*et al.,* (1985), Samples (2g) were extracted at room temperature for 1hour with 16ml of $MgCl_2$ solution (1M $MgCl_2$) at pH 7. Sediment and extraction solution were thoroughly agitated throughout the extraction. This is mainly an adsorption – desorption process. Metals extracted in the exchangeable fraction include weakly adsorbed metals and can be released by ion-exchange process. Changes in the ionic composition of the water would strongly influence the ionic exchange process of metal ions with the major constituents' of the samples like clays, hydrated oxides of iron and manganese. The extracted metals were then decanted from the residual samples for AAS analysis while the residue was used for the next extraction.
Step II- Bound to carbonates: Following Tessier*et al.,* (1985), the metals bound to carbonate phase are affected by ion exchange and changes of pH. The residue of Fraction 1 was extracted with 16ml of 1M sodium acetate/acetic acid buffer at pH 5 for 5 hours at room temperature. Significant amount of trace metals can be co-precipitated with carbonates at the appropriate pH. The extracted metal solution was decanted from the residual bitumen samples for AAS analysis. The residue was used for the next extraction.
Step III- Bound to iron and manganese oxides: Following Tessier*et al.,* (1985), the residue from fraction 2 was extracted under mild reducing conditions. 13.9g of hydroxylamine hydrochloride ($NH_2OH.HCl$) was dissolved in500ml of distilled water to prepare $0.4MNH_2OH.HCl$. The residue was extracted with 20ml of 0.4M $NH_2OH.HCl$ in 25% (v/v) acetic acid with agitation at 96^oC in a water bath for 6hours. Iron and manganese oxides which can be present between particles or coatings on particles are excellent substrates with large surface areas for absorbing trace metals. Under reducing conditions, Fe (III) and Mn(IV) could release adsorbed trace metals. The extracted metal solution was decanted from the residual sediment for AAS analysis while the residue was used for the next extraction.
Step IV – Bound to organic matter and sulphide: Following Tessier*et al.,* (1985), the residue from fraction 3 was oxidized as follows: 3ml of 0.02M HNO_3 and 5ml of 30% (v/v) hydrogen peroxide, which has been adjusted to pH2, was added to the residue from fraction 3. The mixture was heated to 85^oC in a water bath for 2hours with occasional agitation and allowed to cool down. Another 3ml of 30% hydrogen peroxide,

adjusted to pH2 with HNO_3, was then added. The mixture was heated again at 85^oC for 3hrs with occasional agitation and allowed to cool down. Then 5ml of 3.2M ammonium acetate in 20% (v/v) HNO3 was added, followed by dilution to a final volume of 20ml with de-ionized water. Trace metals may be bound by various forms of organic matter, living organisms and coating on mineral particles through complexation or bioaccumulation. These substances may be degraded by oxidation leading to a release of soluble metals. The extracted metal solution was decanted from the residual bitumen samples for AAS analysis while the residue was used for the next extraction.

    Step V – Residual or inert fraction: Following Tessier*et al.,* (1985), residue from fraction 4 was oven dried at 105^oC. Digestion was carried out with a mixture of 5ml conc. HNO_3 (HNO_3, 70% w/w), 10ml of hydrofluoric acid (HF, 40% w/w) and 10ml of perchloric acid ($HClO_4$), 60%w/w) in Teflon beakers after ashing at 500^0C. Fraction 5 largely consists of mineral compounds where metals are firmly bonded within crystal structure of the minerals comprising the sediment. Analysis was carried out with AAS using GBC Avanta PM. Ver 2.02. To validate the procedure, the instrument was programmed and it carried out metal detection by displaying two absorbance readings and what was reported was the average. Blanks were also used for correction of background and other sources of error. Apart from calibration before use, quality checks were also performed on the instrument by checking the absorbance after every ten samples run. 2 grams of the sample was extracted using 16ml of 1M $MgCl_2$ solution (pH = 7.0 with stirring at room temperature for 1 hour with continuing agitation

III. Results And Discussion

    The following results from table1.0 to 3.0 were obtained for the concentrations, forms of labile metals and the rate of absorption in green vegetable of labile metals from each samples collected from the dumpsites.

Table 1.0 Chemical Analysis of Labile Metals from Three Major Dumpsites in Akure Metropolis

SAMPLE SITES	Cd (mg/kg)	Cu (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Ni (mg/kg)	As (mg/kg)	Pb (mg/kg)
A K A	398.000	18.992	98.480	11.240	6870.000	315.250	2340.000	417.450	0.094	36.000
A K B	83.000	4.710	58.600	6.127	5310.000	124.500	1410.000	102.450	0.065	32.000
A K C	900.000	45.450	140.460	21.602	4290.000	654.700	7570.000	714.700	0.305	34.000

AKA= AZ Global Alliance NIG LTD Dumpsite
AKB=Olajide Camp Dumpsite
AKC- Irese Road Dumpsite

Table2: Chemical Speciation of Labile Metals from Three Major Dumpsites in Akure Metropolis

SAMPLE SITES	Cd (mg/kg)	Cu (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Ni (mg/kg)	As (mg/kg)	Pb (mg/kg)
A K A 1	B D L	0.870x50	0.880	B D L	0.190	0.120	0.030	B D L	B D L	B D L
A K A 2	4.930	3.600	2.040	2.450	17.000	3.010	25.500	3.960	0.003	4.090
A K A 3	7.240	7.370	3.520	2.940	45.000	2.080	32.000	7.940	0.001	2.100
A K A 4	0.340	0.942	0.290	1.030	8.000	1.100	13.050	1.030	0.002	0.160
A K A 5	384.350	6.150	91.620	4.710	6799.720	303.900	2269.100	404.490	0.085	29.610
A K B 1	0.280	1.000	0.490	0.530	4.800	0.150	1.030	0.540	B D L	0.090
A K B 2	0.980	1.200	0.540	1.560	5.500	0.050	3.480	1.030	0.005	0.500
A K B 3	0.130	0.180	0.290	0.140	2.000	1.130	2.960	0.030	B D L	0.132
A K B 4	0.370	0.520	0.310	0.170	3.100	1.050	1.740	B D L	B D L	0.351
A K B 5	81.120	1.800	56.960	3.727	5294.00	122.120	1400.750	100.80	0.059	30.925
A K C 1	0.050	0.030	0.282	0.030	0.700	0.190	1.260	1.120	0.007	0.320
A K C 2	15.000	13.970	8.340	5.420	58.200	12.000	91.500	15.200	0.010	0.281
A K C 3	13.000	17.750	6.210	3.930	61.500	8.000	43.000	10.000	0.013	0.277
A K C 4	0.120	1.250	0.360	0.130	5.900	0.020	2.170	4.240	0.011	0.218
A K C 5	871.800	12.420	125.205	12.090	4163.699	634.450	7437.050	680.120	0.200	32.900

Note: BDL= Below detection Limit
Sample Code: 1: Exchangeable Fraction, 2: Bound to Carbonates, 3: Bound to Iron or Manganese oxide, 4: Bound to Organic Mater or Sulphide, 5: Inert Fraction
AKA= AZ Global Alliance Nig. Ltd Dumpsite
AKB=Olajide Camp Dumpsite
AKC- Irese Road Dumpsite

Table3; Rate of Absorption of Labile Metals in Green Vegetables Planted on the Major Three Dumpsites in Akure Metropolis.

VEG. SAMPLES	Cd (mg/kg)	Cu (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Ni (mg/kg)	As (mg/kg)	Pb (mg/kg)
A K A V	31.400	0.200	11.380	0.125	348.500	65.880	210.000	137.300	0.030	14.000
A K B V	36.600	0.500	7.290	0.096	450.550	27.800	457.000	101.900	0.014	28.000
A K C V	99.960	0.390	35.800	0.021	596.900	149.800	1590.000	300.000	0.016	20.000

AKAV= Vegetable from AZ Global Alliance NIG LTD Dumpsite
AKBV= Vegetable from Olajide Camp Dumpsite
AKCV- Vegetable form Irese Road Dumpsite

IV. Discussion:

Table1 showed the results of labile metal concentrations from the major dumpsites obtained from AZ Global Alliance Nig. Ltd Dumpsite (AKA), Olajide Camp Dumpsite(AKB) and Irese Road Dumpsite(AKC)) in Akure town, Akure South local government area of Ondo State. The results for cadmium (Cd) from the three dumpsites in mg/kg (398.000, 83.000 and 900.000) revealed that AKC dumpsite had highest value than AKA and AKB dumpsite respectively. Cadmium had been reported to cause respiratory tract and kidney problems (renal failure) and when ingested caused immediate poison and damage to the liver and kidney (Rahimzadeh*et al.*, 2017). This was found to be most abundant in the inert fraction of the speciation (Step5 of table 2) and the rate of absorption in green vegetable (table3) was higher in Irese road dumpsite with highest concentration.

Copper (Cu) had values of 18.992, 4.710 and 45.450 in mg/kg for AKA, AKB and AKC respectively. Their chemical forms(table2) showed that Cu is abundant in Bound to Iron or Manganese oxide AKA3(7.370) and AKC3(17.750) and the absorption in plant was very low as indicated in table3.Copper compounds, especially its sulphate with minimum dose of 11mg/kg when ingested often not toxic because vomiting automatically triggered by its irritating effect on the gastrointestinal tract but at maximum dose can lead to intravascular haemolysis, methaemoglobinian and acute kidney injury (Gamakaranage*et al.*, 2011).

Chromium had 22.760, 14.580 and 71.600 in mg/kg for AKA, AKB and AKC respectively. Their chemical forms are most abundant in inert fraction (5) (unreactive fraction) and concentration was higher in plant AKCV (35.800mg/kg). Cr (VI) compounds are widely used in industrial processes, such as plating, tanning, painting, pigment production and metallurgy. Additionally, chromium has been an important solid-waste pollutant parameter. They are non-essential metals of no benefit to humans (Marian and Ephraim, 2009). Cobalt ranged between 6.127-21.602mg/kg for the three dumpsites in the city.

Iron (Fe) was the second most abundant labile metals from the three dumpsites as indicated in the chart1. AKA had the highest (6,870mg/kg) and the metal were abundant in the inert fractions (5) of the three dumpsites. The absorption in the vegetables from the three dumpsites showed high concentrations in table3 respectively. Iron is important in haemoglobin formation in animal and healthy growth. Manganese had 315.250, 124.500 and 654.700 in mg/kg for AKA, AKB and AKC respectively. AKC (Irese road dumpsite) had the highest in the soil and the most abundant were found in the inert fraction (5) of the three soils from the dumpsites. The concentration in plant was higher in AKCV (149.800mg/kg) than AKAV (65.880mg/kg) and AKBV (27.800mg/kg) respectively.

Manganese (Mn) concentrations obtained from the dumpsites indicated that Irese Road Dumpsite (AKC) had the highest (654.70mg/kg), followed by AZ global Alliance Nig. Ltd Dumpsite (AKA) (315.25) and the least from Olajide Camp Dumpsite (AKB) (124.50). This metal was most abundant in the inert fraction during speciation in AKC5 (634.450mg/kg) and bond to carbonates (AKC2) (12mg/kg) when compared to the rest as shown in table 2. The absorption concentration in vegetable was higher in AKCV to the rest as indicated in table3.

Zn is very important for the regular functioning of numerous enzyme systems in the body. Zn insufficiency, mainly in children, results to loss of appetite, weakness, growth impedance and cause immobility of sexual development (Saracoglu*et al.*, 2009).Zinc concentrations in the soil were 2340.00, 1410.00, and 7570.00 in mg/kg for AKA, AKB and AKC respectively. The absorption rate in vegetable AKCV (1590.00mg/kg) indicated that the Zinc can be made available for daily intake if the vegetable is consumed. Though, the consumer may be at risk of consuming other toxic labile metals at the same time. The maximum tolerable daily intake of Zn is 0.3-1 mg/ kg as reported by World Health Organization (1982)

According to The Environment Agency (2014), more than 30mg of Nickel may cause changes in muscle, lungs, brain, kidney, liver and can lead to cancer, tremor, paralysis and even death. All the values obtained in the three dumpsites in the soil and in the plant were higher than the tolerable value.

According to WHO (2019), Arsenic is a metalloid element that forms a number of toxic compounds. This is generallydispersed throughout the Earth's crust, and can be released into the atmosphere and water through natural and human activities. Soluble inorganic arsenic is extremely toxic. Chronic arsenic poisoning

(arsenicosis) can result from Intake of inorganic arsenic over a long period while the organic arsenic compounds are not. Symptoms can take years to proceed depending on the exposure level, which include skin lesions, peripheral neuropathy, gastrointestinal symptoms, diabetes, cardiovascular diseases, developmental toxicity, and cancer of the skin and internal organs. Arsenic concentrations in the soil were below the toxicity level, which equally affected the concentration in the vegetable plant.

Consumption of Lead in food samples is not desirable because of its noxiousness. The labile metal concentrations were beyond the Nontoxic limit of lead, which is 2.5 mg/kg) as reported by Sharma *et al*., (2006) and Chirenje*et al*., (2004). The concentrations obtained for AKA (36.00mg/kg), AKB (32.00mg/kg) and AKC (34.00mg/kg) higher, Likewise, the concentrations of absorption in the vegetable were above the Nontoxic limit respectively.

V.   Conclusion

Effects of metals elements on the growth, biochemical and physiological characteristics of plants can be altered by labile metals, as well as influencing the accumulation of essential nutrients in plants. Though, some labie metals can affect the absorption of some nutrients in plants. Labile metals concentrations like Zn and Cd can affect the absorption of essential nutrients for seedlings germination resulting in stunted growth.The contents of labile metals in municipal waste did not become reduced due to continuous composting, but the bioavailability contents for plants were seen to decline.

Notwithstanding,Labile metals also have equally has profound effect on the growth of plants and some plants can reduce the level of labile metal concentration in the through detoxification mechanism.These mechanisms are possible through their individual distinctive characteristics by retarding the absorption of labile metals and reduce the content of labile metals in plants, therefore, reduce the effect of the labile metals on the plant and also Store the absorbed labile metals in trichomes of epidermis to avoid the direct effect of labile metals on the mesophyll. More of the advantages of labile metals are   Precipitation and chelating effect on special site in the plant that equally helped detoxification and rise in the anti-oxidization enzyme activities. Labile metals can equally remove free radicals to prevent the damage to the plant.The Production of many kinds of proteins in plants are induced by labile metals and help to resist the impact of environmental stress in the plant. In spite of these, the fact remains that when the plant are consumed by humans and animals, these toxic labile metals find their ways to the body system and cause harms.

Prolonged consumption of higher concentrations of labile metals through foodstuffs may lead to the chronic accumulation of labile metals in the kidney and liver of humans causing disruption of numerous biochemical processes, leading to cardiovascular, nervous, kidney and bone diseases.

It was observed that most of the labile metals analysed from the three dumpsites, except Arsenic were abundant in the three dumpsites under investigation. These were equally abundant in the inert fraction, which is noxious excluding iron which is metal complex necessary for haemoglobin formation, and these equally reflected in the absorption rates in green vegetable plants evaluated.

It is recommendation that Indiscriminate dumping of refuse in these environments should be controlled and planting of consumable food closer to these environments should be discouraged. Seepage of these metals may equally enter the water bodies and cause serious health problems.

Graphical Illustration
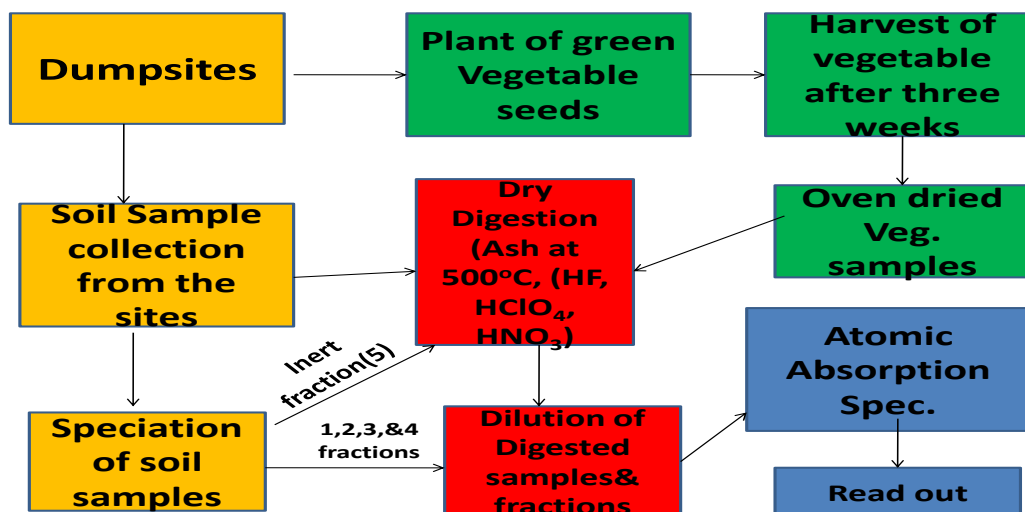
CONFLICT OF INTREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. In addition, the ethical issues; including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy has been completely observed by the authors.

ABBREVIATIONS (NOMENCLATURES):

A O A C= Association of Official Analytical Chemist
AAS= Atomic Absorption Spectrophotometer
AKA= AZ Global Alliance NIG LTD Dumpsite
AKAV= Vegetable from AZ Global Alliance NIG LTD Dumpsite
AKB=Olajide Camp Dumpsite
AKBV= Vegetable from Olajide Camp Dumpsite
AKC= Irese Road Dumpsite
AKCV= Vegetable form Irese Road Dumpsite
As=Arsenic
Cd=Cadmium
CH_3COOH=Acetic Acid
CH_3COONa=Sodium Acetate CH_3COONH_3
=Ammonium Acetate   Co=Cobalt
Cr=Chromium
Cu=Cupper
Fe=Iron
Fig. = Figure
GSH= glutathione
H_2O_2=Hydrogen Peroxide
$HClO_4$=Perchloric   AcidHf=Hydrofluoric Acid
HNO_3= Nitric Acid
$MgCl_2$=Magnesium Chloride
Mn=Manganese
MSW= municipal solid waste
$NH_2OH.HCl$= Hydroxylamine Hydrochloride
Ni=Nickel
Pb=Lead   PCS=
phytochelationsynthase
PCs= Phytochelations   PH=
Hydrogen potential
USEPA= United State Environmental Protection Agency
WHO= World Health Organization
Zn =   Zinc

HIGHLIGHTS

➢   Soil and harvested vegetable samples were obtained from different dumpsites (AZ Global Alliance Nig Ltd Dumpsite, Olajide Camp Dumpsite and Irese Road Dumpsite) in Akure town, Ondo State, Nigeria.
➢   They were brought to Analytical research laboratory in Rufus Giwa Polytechnic, Owo.
•   analyzed for the total concentration of Labile metals,
•   forms at which the labile metals exist
•   their rate of absorption in green vegetables
➢   It is recommendation that Indiscriminate dumping of refuse in these environments should be controlled.

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