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IMPACT OF WASTES ON SOIL PROPERTIES OF AN ACTIVE DUMPSITE IN ORU SOUTH-WEST NIGERIA

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Abstract: Over the years, farmers in developing countries in Africa have resulted to using solid wastes as compost for the replenishment of the deteriorated soils while farming on the abandoned waste dumpsites served as better options to some others due to the richness of their organic contents. This study assessed the soil nutrient and fertility status by investigating the influence of wastes on physical and chemical properties of soils in and around Oru dumpsite for environmental sustainability. Twenty (20) soil samples were collected Oru-dumpsite and two (2) from the control-sites located 200m away from the dumpsite at depth of 0-20cm and were consequently subjected to laboratory analyses for physico-chemical parameters, major elements, and heavy metal concentrations while simple descriptive analyses were applied on the obtained results. The outcome of this investigation revealed that all the parameters in the dumpsites were higher than that of the control sites inclusive of the micronutrients parameters including the micronutrients parameters (TOC, TOM, NO_3, PO_4, H) with the mean value of 26.0704 ± 29.25; 23.008 ± 7.661; 0.081 ± 0.1461; 10.52 ± 4.756; 4.122 ± 9.874 and 9.715 ± 0.587; 9.285 ± 0.275; 0.001 ± 0.001; 3.18 ± 0.099; 0.04 ± 0.01 respectively for the dumpsite and corresponding control-sites. The heavy metal concentrations namely Fe, Zn, Cu, Mn, Cl, Pb, Cd, As, Cr, Ni were equally found to be higher than the contol-sites with speciation of Br, Si and I left undetected in the control-sites but fully detected in dumpsite with mean values of 0.0023 ± 0.0019, 0.0039 ± 0.00651 and 0.00142 ± 0.0007 respectively. In addition temperature, Fe and Pb concentrations were found to be higher than the international permissible standards including WHO and FAO. This study has evidentially revealed that deposition and subsequent accumulation of wastes have impacted the physical and chemical properties of the dumpsite by improving soil organic matter contents and increasing nutrient contents such as exchangeable bases and micronutrient, thus enhancing soil organic matter, fertility and productivity status of the soil for maximum plant growth. However, elevated values of the identified heavy metal concentrations in dumpsite soils call for incessant monitoring and consequent assessment. Thus, encouragement of sorting, reuse and recycling is highly needed to reducing the metal loads over time.

Keywords: Sustainability, Sorting, Electrical Conductivity, physico-chemical, Exchangeable Bases

Introduction

Environmental pollution caused by open dumping and indiscriminate waste disposals have been a serious challenge in most countries of the world owing to the adopted waste disposal method and management responses adopted in the affected communities. Rapid growth and continuous increase in human and biological population, urbanization, industrial development and commercial activities have resulted to uncontrolled daily increase in solid and associated wastes being generated in these societies (Mouhoun-Chouaki *et al.,* 2019; Essienubong *et al.,* 2019; Nta and Odong, 2017; Karak *et al.,* 2012, Akintola, 2014; Skye, 2006).

Toxic substances released from the decomposition of the deposited wastes may worsen and weaken the human environment (Kebede et al., 2016; Beyene and Banerjee, 2011). The negative impacts of improper solid waste management on the ecosystem have been at alarming rate in developing countries of the world such as Nigeria. Much research activities have been carried out on the impacts of solid waste dumpsite and heavy metal contaminations on soil, water resources quality and the ecosystem at large (Akintola *et al*., 2019; Akintola and Bodede 2019; Hammed *et al.,* 2017; Ewemoje *et al.,* 2017; Sulaiman *et al.,* 2016; Ganiyu *et al.,* 2016, Oguiseju *et al.,* 2015; Akintola, 2014). Recent use of solid wastes as compost to replenishing the deteriorated soils and growing of crops on the abandoned waste dumpsite due to their richness in organic matter by farmers has been of great concern to the stakeholders in Agriculture. Leachates are liquid substances that emanate from the decomposed wastes in the dumpsite and contain considerable quantity of major and micro elements, compounds and organic substances which not only have the capacity to increase over time but may even be greater than the required amounts needed for targeted plant growth and environmental sustainability (Essienubong *et al.,* 2019; Suilaman *et al.,* 2016; Akintola, 2014). These leachates may find their ways into the soil with unprecedented impacts on the subsurface system through surface run off, leaching, percolation or infiltration and may consequently be dangerous to soils, plants, surface and groundwater over time. This may also have significant negative impacts on the physical and chemical properties of the soil by increasing the soil moisture content, organic matter content and alkalinity of the soil through decomposition of organic wastes by the variable actions of soil microbes and climate (Dominquez *et al.,* 2019; Kebede *et al.,* 2018). Furthermore, daily increase in human population has led to high demand for food and other agricultural products coupled with the hike in prices of inorganic fertilizers; which some farmers have resulted to using the cheaply available wastes within their disposals as composts for amendment of deteriorated soil or soil with low fertility for improvement of the degraded soil nutrient, fertility and productivity for overall agricultural sustainability. Though, compost or used solid waste soils may be rich in organic content but there is likelihood of substantial increase in some of the nutrients present in the wastes as time passes. If micro-nutrients such as Fe, Zn, Cu, Ni and Mn among others are higher than the required quantity needed in the soil, their elevated status may be poisonous to the to the plant community and ecosystem at large. As such, the potential negative impacts of solid wastes on affected soils must be taken into consideration (Dominguez *et al.,* 2019). This study has therefore assessed the nutrient and fertility status of the soil in the study area with the aim of thoroughly investigating the impacts of wastes on physical and chemical properties of the investigated soil samples in and around residential community of Oru dumpsite for the ultimate purpose of safeguarding the toxicological health of plant community and overall environmental sustainability.

Materials and Methods

Study Area

Location and Accessibility

The study area is located in Oru-Ijebu between longitudes 6º56"N and 6º58"N and latitude 3º56"E and 3º51"E within the South Eastern part of Ogun state, where it shares a common boundary with Oyo state (Fig. 1). It's proximity to Awa, Ijesha-Ijebu, Ago-Iwoye, Mamu as neighbouring towns make it easily accessible within the district. The area falls within the basement complex rock of Nigeria. The area extent is 10.5 km^2. Accessibility varies with the distribution of outcrops; most places were easily accessible, while some were close to the numerous footpaths (Ishola *et al.,* 2024). In some areas there are also minor footpaths that have developed to minor road linking to various areas. The relief is moderately low forming ridges in some places an undulated plain dotted with small isolated hills or hills rocks are noticed generally within Ago Iwoye. The general level of surface rises Northwards from about 0.0 m to 500 feet above the coast northward to the area of the crystalline rocks (Ishola *et al.,* 2024).

Geology and Climate of the Study Area

The topography of the study area is generally undulating ranging from high to low relief. Highest peaks are 112 m and lowest peak is 40 m. The drainage patterns are dendritic and reflect the land forms, soil types and their occurrences. It should be noted that the drainage pattern of any area is influenced by the topography. It is also characterized by a double rainfall with peaks falling between June and September. December and January are relatively dry. The temperature is within the range of 26 ^0C to 36 ^0C (Ishola *et al.,* 2024). Oru-Ilaporu type is found locally in the basement complex rock in the southwest Nigerian state of Ogun. The major rocks found in the study area include; Granite Gneiss, Banded Gneiss and Pegmatite; Pegmatite being the most common type of rock in the research region. The majority of the rocks in this area have undergone varying degrees of weathering, from recently formed formations to heavily weathered ones. Numerous related minerals have been identified, each with unique diagnostic features. These include quartz, biotite, hornblende feldspar, plagioclase, muscovite, and microcline feldspar (Ishola *et al.,* 2024; Ishola and Olufemi, 2024).

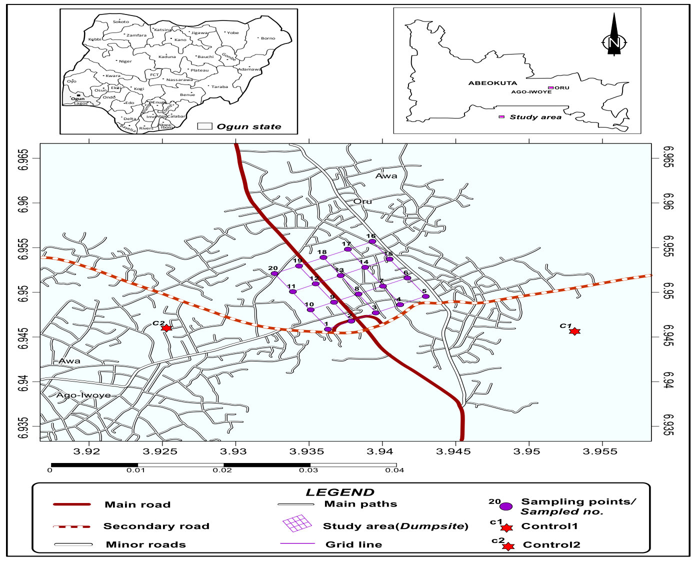

Fig. 1: Location and Accessibility Map (Ishola et al., 2024).

Sample Collection, Preparation and Analysis

Soil samples were collected on the dumpsite with a dimension of 40 m by 12 m from twenty (20) sampling points at a depth of 0.2 m which were compared with two (2) control sampling points at separate distance of 200 m away from the investigated dumpsite using soil auger and shovel (Fig. 2). Soil samples collected in each case, were clearly labelled accordingly in a polythene bag and transported to the laboratory for pretreatment and subsequent analyses for physiochemical properties. The undisturbed soil samples were also collected using core cutters and sealed immediately on both edges with candle wax to avoid loss of moisture. The physical analyses (such as moisture content, temperature, electrical conductivity, pH, cation exchange capacity, organic matter content) and chemical analyses (such as nitrate, available phosphorus, Na, K, Ca, Mg, Fe, Cu, Zn, Pb and Mn) were conducted on the collected soil samples using standard as standard laboratory procedures. The moisture content of the collected disturbed soil samples was estimated by subtracting the weight of the dried soil from weight of the wet soil and then divides by the constant weight of the dry soil while maintaining the temperature between 105 ^0C to 115 ^0C within the sufficient period of 16 to 24 hours. The pH of the soil samples was measured using electrode pH meter in 1:1 water-soil solution while soil electrical conductivity was measured using standard portable conductivity meter (MW301, Milwaukee, Wisconsin USA) on extract from 1:2.5 soil to water. Soil organic carbon contents were determined using the method adopted by Akintola *et al.,* (2021) and then multiplied by 1.724 for soil organic matter content determination. Total nitrogen and available phosphorus were determined by micro-kjeldhal digestion- distillation methods (Liu *et al.,* 2012; Tahir *et al*., 2005) and electro-photometer method (Bray and Kurtz, 1945; Zhu *et al*., 2008) respectively. The concentration of sodium, potassium, calcium and magnesium were determined by the method of analysis given by Black (1998). The concentrations of Fe, Zn, Cu, Pb and Ni were measured using Atomic Absorption Spectrophotometer

(AAS, PerkinElmer). Simple descriptive statistics were carried on the acquired data using IBM SPSS statistical software package 20.0 version. The results were presented in tabular forms with mean concentration values (MEAN) and corresponding standard deviation (SD) in Table 1 and Table 2.

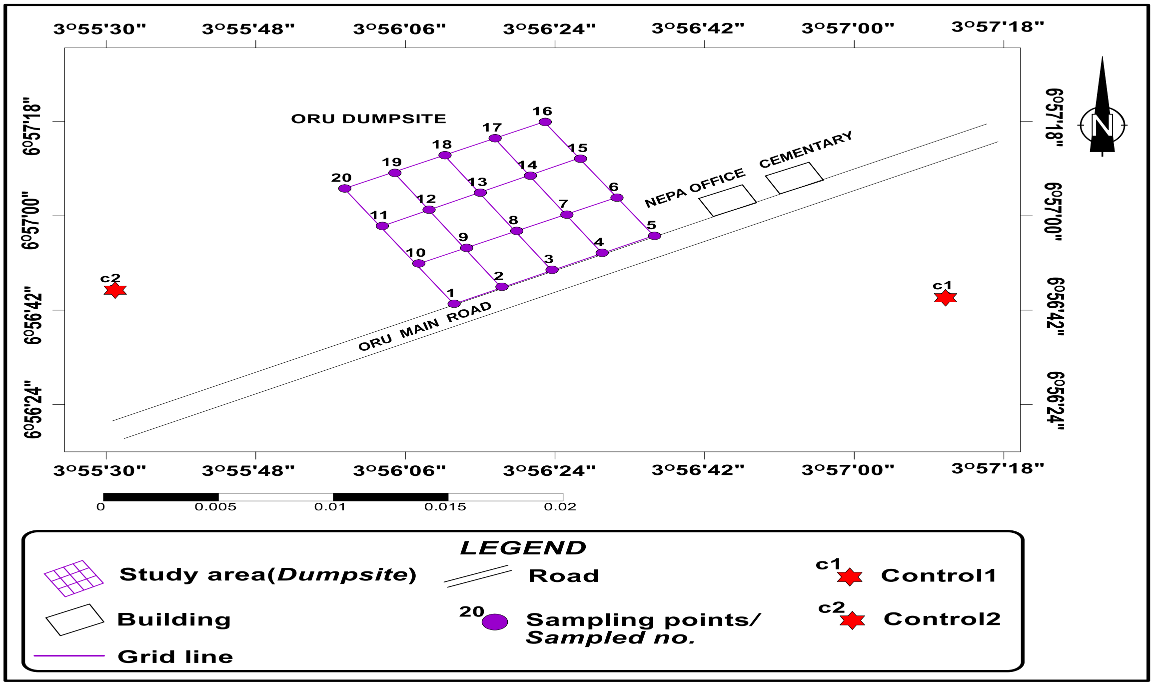

Fig. 2: Field Set-Up/ Data Acquisition Map (Ishola *et al.,* 2024)

Results and Discussion

The pH of the studied soils ranged from 6.00 to 6.04 (slightly acidic) with a mean value of 6.39±0.87 on the dumpsite while the control-sites ranged from 5.41 (acidic) to 8.89 (moderately alkaline) and exhibited a mean value 7.15±2.46 (Table 2). This is higher than the values (4.8-7.66) obtained by Obianefo *et al.,* (2017) but within the earlier findings on dumpsites by Obasi *et al.,* (2012); Osunwoke and Kurofiji (2012); Mouhoun-Chouaki *et al.,* 2019 and Enerijiofi and Ekhaise, 2019 and Agbeshie *et al.,* 2020. The significant higher pH values recorded in the dumpsite soils could be attributed to the presence of high quantity of liming material, and biological activities (soil microorganism) on the solid wastes (Ideriah *et al.,* 2006; Osei *et al*., 2011; Kebede *et al.,* 2016; Agbeshie *et al.,* 2020). Generally, it has been reported that pH has unswerving relationship with soil chemical properties and nutrients are made available to plants in higher concentration at pH value of 6.5-7.5 (Whalen, 2000; Praveena and Rao, 2016). Thus, it is a major property that determines numerous chemical processes that occurs in soil (Chng *et al.,* 2014). The electrical conductivity values of the dumpsite soils ranged from 160.50 to 171.40 µS/cm with mean value of 155.99±51.65µS/cm while soils from the control-sites have the EC values ranging from 128.67 to 138.27µS/cm with exhibited mean value of 133.47 ± 6.788µS/cm (Table 1 and 2). According to Goswami and Sarma (2008) the soil pH may reduce with depth due to the leaching action of waste, mechanical composition, nature of soil. The pH of the soil samples in the current study showed slightly acidic nature. It indicates the concentration of hydrogen ions in the soil solution; it affects the nutrient availability, microbial activity, and plant growth. A slightly acidic pH enhances s the availability of certain nutrients like phosphorous, potassium, and magnesium which are essential for plant growth. It also promotes the activity of beneficial soil microorganisms that contribute to nutrient cycling. However, excessively acidic soils can hinder the availability of other nutrients like calcium and may require adjustments to adjust to the pH. The pH is very crucial in terms of the mobility of metals, their bioavailability. Metal availability is very low when the pH is around 6.5-7.0 (Chimuka *et al*., 2005). Slightly acidic soil conditions result in nutrient availability, aluminum toxicity, especially in arid and semi-arid conditions thus favoring plant growth. (Ali *et al*., 2014). The high pH value of the soil may be attributed to the quality of leachate leaching from the dumpsite. (Olagunju *et al*., 2007). The presence of carbonates, bicarbonates, sodium, potassium, and other acidic materials contribute to the slightly acidic nature of the soil and the most optimal range of the pH of the compost for crop yield has been reported to be in the range of 5.5 - 8.5 (Goswami and Sarma, 2008). Another reason for the high pH may be mineralization of carbon, presence of basic cations caused by erosions, leaching and this is because basic cations increase as pH and CEC increase and vice versa and also the subsequent production of $0H^-$ ions by ligand exchange along with the introduction of basic cations such as K^+, Ca^{2+} , Mg^{2+} (Omoigui and Onyeabor, 2019; Onyekwere and Nwakana, 2002). Soils within the area are in the range of the Food and Agriculture Organization/World Health Organization (FAO/WHO, 2001) limit which indicates that the soil around the area is safe for agriculture purpose (FAO, 2004; FAO/WHO, 2001).

Table 1: Mean and Standard Deviation of Chemical Parameters at Depth 20cm

CHEMICAL PARAMETERS	MEAN±SD	RANGE	WHO	FAO
pH	6.9305±0.8161	6.04 - 6.0	6.5 – 8.5	6.5 – 8.5
EC (us/cm)	155.99±51.65	171.4 - 160.5	300	300 - 500
TEMP (°C)	**50.02±57.92**	26.1 - 22.4	6.5 – 9.5	NA
H	4.122±9.874	26.1 - 22.4	NA	NA
Ca(mg)	0.292±0.125	0.36 - 0.18	NA	10 – 50
Na (mg)	0.4005±0.1518	0.48 - 0.32	NA	0.3 – 0.5
Mg (mg)	0.697±0.589	0.86 - 0.12	50.00	<5
CEC	2.0325±0.862	2.32 - 1.68	NA	NA
BS (%)	77.93±37.1043	95.44 - 93.45	NA	NA
TOC (%)	26.704±29.254	24.1 - 16.9	NA	NS
TOM (%)	23.008±7.661	41.55 - 29.19	NA	3
PO4 (mg)	10.52±4.756	10.6 – 6.8	NA	NA
SO4 (mg)	9.88±4.367	9.62 – 5.92	NA	NA
Fe (mg)	**3.157±5.423**	3.1 – 0.23	0.30	5.0
Zn (mg)	1.556±0.945	2.70 – 0.18	5.50	2.0
Cu (mg)	0.557±0.661	0.48 – 0.34	73.3	<2
Mn (mg)	0.348±0.1903	0.44 – 0.29	NA	NA
Cl (mg)	0.366±0.131	0.36 – 0.25	NA	NA
NO3 (mg)	0.081±0.1461	0.007 – 0.01	NA	NA
Pb (mg)	**0.156±0.122**	0.14 – 0.05	0.01	<0.001
Cd (mg)	0.1075±0.0561	0.15 – 0.04	74	NA
As (mg)	0.059±0.0388	0.05 – 0.02	0.3	NA
Cr (mg)	0.097±0.071	0.08 – 0.02	0.50	0.10
Ni (mg)	0.0385±0.0252	0.03 – 0.01	67.9	NA
Br (mg)	0.0023±0.0019	0.002– 0.001	NA	NA
Si (mg)	0.0039±0.00651	0.002– 0.001	NA	NA
Tn (mg)	1.8175±1.2523	2.41 – 1.52	NA	NA
P (mg)	9.778±4.0611	9.8 – 5.8	NA	10 – 20
K	0.614±0.16501	0.61 – 0.39	NA	0.3 -0.5
I	0.00142±0.0007	0.0001 – 0.001	NA	NA

Table 4: Mean±SD of Chemical Parameter of Control Sites at Depth 20cm

CHEMICAL PARAMETERS	MEAN±S.D	RANGE	WHO	FAO
PH	7.15±2.460	8.89 – 5.41	6.5 – 8.5	6.5 – 8.5
EC	133.47±6.788	138.27 – 128.67	300	300 – 500
TEMP	20.75±0.0283	20.77 – 20.73	6.5 9.5	NA
H	0.04±0.01	0.04-0.01	NA	NA
Ca(mg)	0.215±0.0070	0.22 – 0.21	NA	10 – 50
Na(mg)	0.325±0.0070	0.33 – 0.32	NA	NA
Mg(mg)	0.44±0.0567	0.48 – 0.40	50.00	< 5
CEC	1.515±0.191	1.65 – 1.38	NA	NA
BS	46.33±0.0707	46.38 – 46.28	NA	NA
TOC	9.715±0.587	10.13 – 9.30	NA	NA
TOM	9.285±0.275	9.48 – 9.09	NA	NA
PO_4(mg)	3.18±0.099	3.25 – 3.11	NA	NA
$S0_4$(mg)	0.36±0.057	0.40 – 0.32	NA	NA
Fe(mg)	0.365±0.205	0.51 – 0.22	0.30	5.0
Zn(mg)	0.165±0.007	0.17 – 0.16	5.50	2.0
Cu(mg)	0.12±0.014	0.13 – 0.11	73.3	< 2
Mn(mg)	0.025±0.0070	0.06 – 0.05	NA	NA
Cl(mg)	0.145±0.035	0.19 – 0.16	NA	NA

NO_3(mg)	0.001±0.00	0.001 – 0.001	NA	NA
Pb(mg)	0.035±0.0212	0.05 – 0.03	0.01	< 0.001
Cd(mg)	0.025±0.007	0.03 – 0.02	74	NA
As(mg)	0.01±0.00	0.01	0.3	NA
Cr(mg)	0.01±0	0.01	0.50	0.10
Ni(mg)	0.015±0.007	0.02	67.9	NA
Br(mg)	ND±ND	ND	NA	NA
Si(mg)	ND±ND	ND	NA	NA
Tn(mg)	1.33±0.254	1.83 – 1.17	NA	NA
P(mg)	2.545±0.446	2.87 – 2.58	NA	10 – 20
K	0.395±0.205	0.54 – 0.35	NA	0.3 – 0.5
I	ND±ND	ND	NA	NA

The availability of organic carbon (OC) in soils has resulted in rise in the cation exchange capacity which helps in the accumulation of nutrients taken in by plants. OC is the preserved carbon in organic matter. The percentage of organic carbon in the dumpsite was 26.70±29.25 low organic carbon content in the studied dumpsite was attributed to high amount of sand fraction obtained from particle size distribution due to the non-degradation of solid waste found around dumpsites. The TOM (Total Organic Matter) value of soil sample in the studied dumpsite varied from 23.008±7.661 to 15.05±10.05٪ at depth 0-20m to 80-100m respectively. The TOM improves the importance of soils for agricultural use, an increase in TOM >2.0٪ in soils is favorable for heavy metal chelation formation.

Copper is an essential micronutrient required in the growth of both plants and animals and serves as the third most used metal in the world (Njoku, 2015). The concentration of Cu in all the samples analyzed was lower than the WHO/FAO permissible limit of 0.50mg/kg exhibiting a mean concentration value of 0.557±0.661 in the investigated area. The role of Mn in the functioning of the central nervous system is highly essential. The mean concentration of Mn at the dumpsite was 0.348±0.1903 (348 mg/kg) which is far above the WHO standard of 2.00 mg/kg but below the FAO standard of 5.00mg/kg. This could interfere with nutrient uptake and affect plant growth and development, if it leaches into groundwater and surface water, it can cause potential harms to human and ecosystems. The number of exchangeable cations per unit mass of dry soil which perform a major importance in soil fertility is known as cation exchange capacity (CEC). It means the total number of exchangeable basic cations such as: Calcium (ca), Sodium (Na), Magnesium (Mg) and Potassium (K) ions in the sampled soils (Fig. 3); they rely on the competence of absorption of heavy metals. It depends on the summation of properties of soil and particular properties of soil like pH, clay and organic matter (OM) contents of soil; the result of CEC in the studied dumpsite is 2.0325±0.862. The low CEC content in the sampled soil was as a result of increase in sand fractions at the upper layer of subsurface sediments. The soil with low CEC content may yield insufficient Ca, Na, Mg, K and low organic matter. The mean value of P in the dumpsite at depth was 9.778±4.0611; the low concentration level of P in the sampled soil around the dumpsite was due to higher content of non-biodegradable waste caused by micro-organisms, low level of organic matter (OM) and degradation of agricultural materials in the dumpsite.

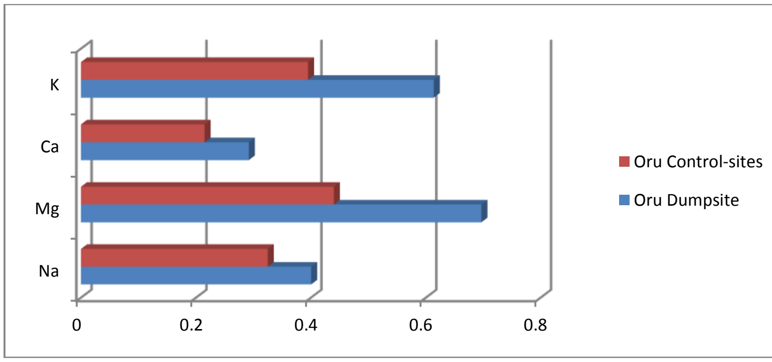

Fig. 3: Variations of cations levels of Oru Dumpsites and Control-sites

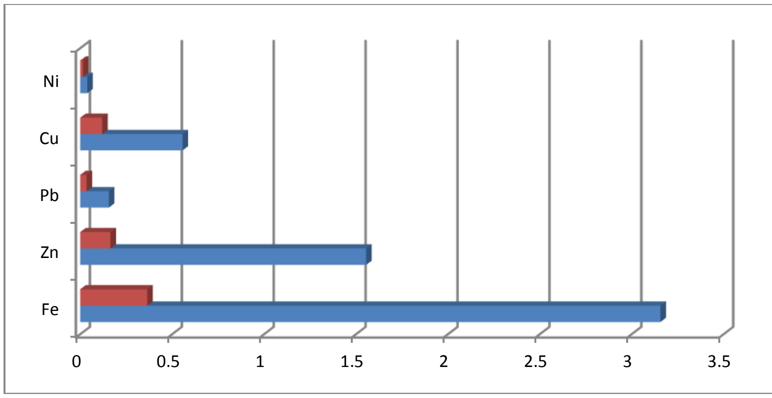

Fig. 4: Variations of Heavy Metal concentrations of Oru Dumpsites and Control-sites

Mean concentrations of Ca were higher in the dumpsite soils with mean value of 0.292±0.125 (292 mg/kg) than the control-sites with the mean value of 0.215±0.007 (215 mg/kg) and ranged from 0.18 to 0.36 while the latter ranged from 0.21 to 0.22 (Table 1 and Table 2). The mean concentration of Mg in the soils ranged from 0.12 to 0.86 with a mean value of 0.697±0.589 while those from control-sites were found to be 0.444±0.0567 (444 mg/kg) and ranged from 0.40 to 0.48. The respective mean concentrations of Na and K in soils from dumpsite were 0.4005±0.1518 and 0.614±0.1650 and their corresponding control sites values were 0.325±0.007 and 0.395±0.205 as presented in Table 1 and Table 2. The high exchangeable bases recorded in dumpsite soils also affirmed the highest mean pH value at the dumpsite soils, thus indicating the beneficial influence of Na, K, Ca and Mg on soil pH (Agbeshie *et al.,* 2020). The relative high exchangeable bases in the studied dumpsite soils is an indication of increase in nutrient availability and soil microbial activities, thus the soil will be good for nurturing, farming and management of agricultural plants (Okonkwo *et al.,* 2013). This confirms why farmers consciously choose to farm on such site.

The mean concentrations of the heavy metals in the soils showed that Fe had the highest concentrations in the studied soil samples both at the dumpsites and control sites (Table 3). Iron (Fe) showed significantly higher mean concentration value in the soil from dumpsite 3.157 ± 5.423 (3157 mg/kg) than control sites 0.315 ± 0.205 (315 mg/kg). The respective mean concentration values of Zn, Cu, Pb and Ni in the soils from dumpsite soils were 1.556 ± 0.945, 0.557 ± 0.661 , 0.156 ± 0.122 and 0.0385 ± 0.00252 while those from the control-site soils were Zn 0.165 ± 007 (165 mg/kg), Cu 0.12 ± 0.014 (12 mg/kg), Pb 0.035 ± 0.020 (35 mg/kg) and Ni 0.015 ± 0.007 (15 mg/kg) (Table 1 and Table 2). The concentrations of the micro nutrients in the soil samples of the study area were in order of Fe > Zn > Cu > Pb > Ni (Fig. 4). Higher heavy metal concentrations observed in the dumpsite soils agreed with the findings of Njoku (2015) and Agbeshie *et al.,* (2020). Fe concentrations in the studied soils were higher than the recommended values given by some researchers (Vecera *et al.,* 1999) as shown in Table 3. The relatively higher concentrations of Fe in the studied soil may be attributed to its abundance in the earth crust, wastes rich in Fe as well as the mineral composition of the underlying rocks in the studied area. Iron (Fe) is generally needed by plants for nurturing, growth and development (Agbeshie *et al.,* 2020). Zinc concentration is next to Fe in the studied area. Zinc concentration in the studied soils were higher than the recommended values given by EC (1986); MAFF (1992) and Vecera *et al.,* (1999) but within the value given by Alloway (1996) as presented in Table 3. Higher Zn concentrations recorded from the dumpsites could be attributable to deposition of materials that are rich in heavy metals such as used battery, electronic materials among others into the dumpsite. As a micronutrient for plant growth, Zn plays an important function in enzyme reaction activities in the soil, thus it relative presence in the soil may lead to reduction in the level of cadmium uptake by plants (Chahab and Savaghebi, 2010). Variable Pb concentrations at different locations may be attributed to the deposition of waste materials such as lead pipe, PVC, insecticides, batteries and paints among others on the site (Akintola, 2014). Concentrations of Pb in the studied soils were within the recommended values given by Kabata-Pendias and Pendias, (1984) and Alloway, (1996). The Cu concentrations in the studied soils were within the recommended values given by EC (1986); MAFF (1992) but higher than those given by Kabata-Pendias and Pendias, (1984), Alloway, (1996) and Vecera et al., (1999) while Ni concentrations were within the recommended values given by Bowen, (1979); FAO/WHO, (2001) and Vecera *et al.,* (1999) but higher than those given by Vecera et al., (1999). Generally, the higher concentrations of heavy metals in dumpsite than the control-sites soils agreed with the reports of Njoku, (2015) and Agbeshie *et al.,* (2020). High heavy metal concentrations recorded when compared with the recommended values may indicate contamination of these metals and may have adverse effects on the environment over time.

Table 3: Comparative Analyses of heavy Metal Levels in this Study with the Recommended Levels by Published Literatures Based on the Mean Concentrations.

Authors	Fe (mg/kg)	Zn (mg/kg)	Pb (mg/kg)	Cu (mg/kg)	Ni (mg/kg)
Kabata-Pendias and Pendias, (1984)	−	−	30 − 300	250	−
Brady (1984)	26000	−	19	25	19
Bowen (1979)	100-700	100	2.0−200	300	50
FAO/WHO (2001)	100-1000	300	50	300	−
Alloway (1996)	−	1-900	2.0−300	2.0−200	−
Vecera et al., (1999)	100-700	10-300	2.0−300	2.0−100	−
This Study	**3157**	**1556**	**156**	**557**	**38.5**

Conclusion

This study has assessed some physical and chemical properties of soil in Oru dumpsite and the associated control sites. The study revealed that the deposition and decomposition of wastes has led to significant impact on soil pH, electrical conductivity, exchangeable bases and heavy metals (Fe, Zn. Pb, Cu and Ni) by inhibiting plant growth and development. The higher pH values and organic matter content in the dumpsite soils has increased the soil nutrient contents such as exchangeable bases and micronutrient, thus enhancing soil microbial activities, fertility and productivity status of the soil for maximum plant growth. The study also revealed that the soils near the dumpsite may be exposed to poisonous pollutants derived from solid waste due to high level of physiochemical properties present in the soils affecting the environment close to the dumpsite because the concentration of heavy metals in the dumpsites were higher than that of the control sites. Unmanaged dumpsite may lead to pollution of water resources, soil, air, and affects the flora and fauna to varied extent. However, Elevated physico-chemical parameters notably temperature and heavy metal concentrations like Iron and lead in Oru dumpsite soils call for incessant assessment and monitoring, thus sorting, reuse and recycling should be encouraged to reduce the metal loads over time.

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