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Impact of Wastes on Some Properties of Soil around an Active Dumpsite in Ibadan, Southwestern Nigeria

Oluwatoyin Opeyemi Akintola
Department of Forestry Technology, Federal College of Forestry, Ibadan, Nigeria. Forestry Research Institute of Nigeria, Ibadan, Oyo State, Nigeria., toyinakintola73@gmail.com

Gabriel Oladapo Adeyemi
Department of Geology, University of Ibadan, Oyo State, Nigeria., adedapodrngus@yahoo.com

Oluwayemisi Samuel Olokeogun
Department of Forestry Technology, Federal College of Forestry, Ibadan, Nigeria. Forestry Research Institute of Nigeria, Ibadan, Oyo State, Nigeria., olokeogunoluwayemisi@gmail.com

Idayat Adewunmi Bodede
Department of Crop Production Technology, Federal College of Forestry, Ibadan, Nigeria, Forestry Research Institute of Nigeria, Ibadan, Oyo State, Nigeria., wunmex002@gmail.com

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Cover Page Footnote

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IMPACT OF WASTES ON SOME PROPERTIES OF SOIL AROUND AN ACTIVE DUMPSITE IN IBADAN, SOUTHWESTERN NIGERIA

OLUWATOYIN OPEYEMI AKINTOLA[1,2], GABRIEL OLADAPO ADEYEMI[3], OLUWAYEMISI SAMUEL OLOKEOGUN[1,2] AND IDAYAT ADEWUNMI BODEDE [2, 4]

[1] *Department of Forestry Technology, Federal College of Forestry, Ibadan, Nigeria.*
[2]*Forestry Research Institute of Nigeria, Ibadan, Oyo State, Nigeria.*
[3] *Department of Geology, University of Ibadan, Oyo State, Nigeria.*
[4]*Department of Crop Production Technology, Federal College of Forestry, Ibadan, Nigeria.*

Corresponding authors email: toyinakintola73@gmail.com

ABSTRACT

Recently most farmers in developing country like Nigeria has resulted to the use of solid wastes as compost to replenish the deteriorated soils while some are farming on the abandoned waste dumpsite due to their richness in organic matter. This study assessed the soil nutrient and fertility status by investigating the influence of wastes (if any) on physical and chemical properties of soils in and around Lapite dumpsite for environmental sustainability. Ten soil samples each collected from three locations: dumpsite, downslope and upslope sites at depth of 0-20cm were analyzed for soil texture, bulk density, porosity, electrical conductivity, pH, organic carbon, organic matter content (OMC), total nitrogen (TN), available phosphorus (AP), Na, K, Ca, Mg, Fe, Zn, Cu, Pb and Ni. Significant differences were observed on soil physical: moisture content (18.05-38.11 %); Bulk density (1.01-1.54 g/cm^3); porosity (49.09-74.56 %) and chemical properties: : OMC (1.39-5.98 %);TN (0.58-1.60 %); AP(0.35-1.09 %) among others in soils from the studied location sites at $p \leq 0.05$; however, no remarkable impact was noticed on soil texture. This study has shown that deposition of wastes has impacted the physical and chemical properties 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, increase in heavy metal concentrations in dumpsite soils call for incessant assessment and monitoring, thus sorting, reuse and recycling should be encouraged to reduce the metal loads over time.

Keywords: Heavy metal, incessant assessment, lapite dumpsite, organic matter, plant growth.

INTRODUCTION

Environmental contaminations by solid wastes have been a serious issue in most countries of the world owing to the waste disposal method and management. Solid wastes are being generated on daily basis due to rapid growth and continuous increase in human population, urbanization and industrial development (Karak et al., 2012, Akintola, 2014, Essienubong et al., 2019; Mouhoun-Chouaki et al., 2019).

Toxic substances may be released from the decomposition of the deposited wastes and this may worsen and weaken the environment (Beyene and Banerjee, 2011; Kebede et al., 2016). The negative influences of improper management of solid wastes on the ecosystem have been at alarming rate in developing countries such as Nigeria. Much research have been conducted on the influence of solid waste dumpsite on water resources quality as well as the heavy metal contamination on the environment (Akintola et al., 2019; Akintola and Bodede 2019; Oguiseju et al., 2015; Ganiyu et al., 2016, Sulaiman et al., 2016 Hammed et al., 2017; Ewemoje et al., 2017; Akintola, 2014).

Recent use of solid wastes as compost to replenish the deteriorated soils and growing of crops on the abandoned waste dumpsite due to their richness in organic matter by farmers is of great concern. Leachates, the liquid substances emanating from the wastes during decomposition in the dumpsite contain considerable quantity of elements, compounds and organic substances these can increase over time and may be more than the required amounts needed for environmental sustainability (Suilaman et al., 2016; Akintola, 2014, Essienubong et al., 2019). These leachates may enter into the soil through surface run off, leaching, percolation or infiltration and become dangerous to soils, plants, surface and groundwater over time. This may also have significant effects on the physical and chemical properties of the soil by increasing the soil moisture content, organic matter content and alkalinity nature of the soil through decomposition of organic wastes by the action of soil microorganism and climate (Kebede et al., 2018).

The important effects of organic matter on soil and its maintenance are of important to ensure soil quality and sustainability since long term use of inorganic fertilizers can cause loss of soil organic matter (Dominquez et al., 2019). Increase in human population has led to high demand in food and other agricultural products; as such some farmers have resulted to the use of solid wastes as composts for amendment of degraded soil or soil with low fertility for improvement of soil nutrient, fertility and productivity for agricultural sustainability. Though, the solid waste soils or compost may be rich in organic matter but there is likelihood of substantial increase in some of the nutrients present in the wastes over time. If micro-nutrients such as Fe, Zn, Cu, Ni and Mn among others are higher than the required quantity needed in the soil, they may be poisonous to the ecosystem. As such, the potential negative impacts of solid wastes on soils must be taken into consideration (Dominguez et al., 2019). This study assessed the soil nutrient and fertility status by investigating the influence of wastes (if any) on physical and chemical properties of soils in and around Lapite dumpsite for environmental sustainability.

MATERIALS AND METHODS

Study Area

The study was conducted within Lapite dumpsite in Akinyele Local Government area of Ibadan City, Southwestern Nigeria (Fig. 1). Ibadan has two different seasons; the rainy season between April to October and dry season between November and March. They are characterised by respective high rainfall with a mean annual rainfall of about 1237mm and dry dust laden winds with temperatures ranging between 24.5 ^oC and 28.8 ºC (Olayinka et al., 1999). The study area is within the tropical rain forest of Nigeria and is characterized by bush, herbs, shrubs, trees, grasses, palm vegetation (Akintola, 2014). The topography of the area has varies elevation values that ranged between 246 to 265 m above sea level and it s well drained by streams and rivers (Akintola, 2014).

Geologically, the study area fall within Crystalline Basement Complex rocks of southwestern Nigeria and comprises igneous and metamorphic rocks such as gneisses, migmatites as well as older granite ridges and pegmatite. The major rock types in study area and it’s environ are migmatite and banded gneisses and these are invariably fractured

(Akintola, 2014). The rocks are coarse grained in texture and light grey in colour.

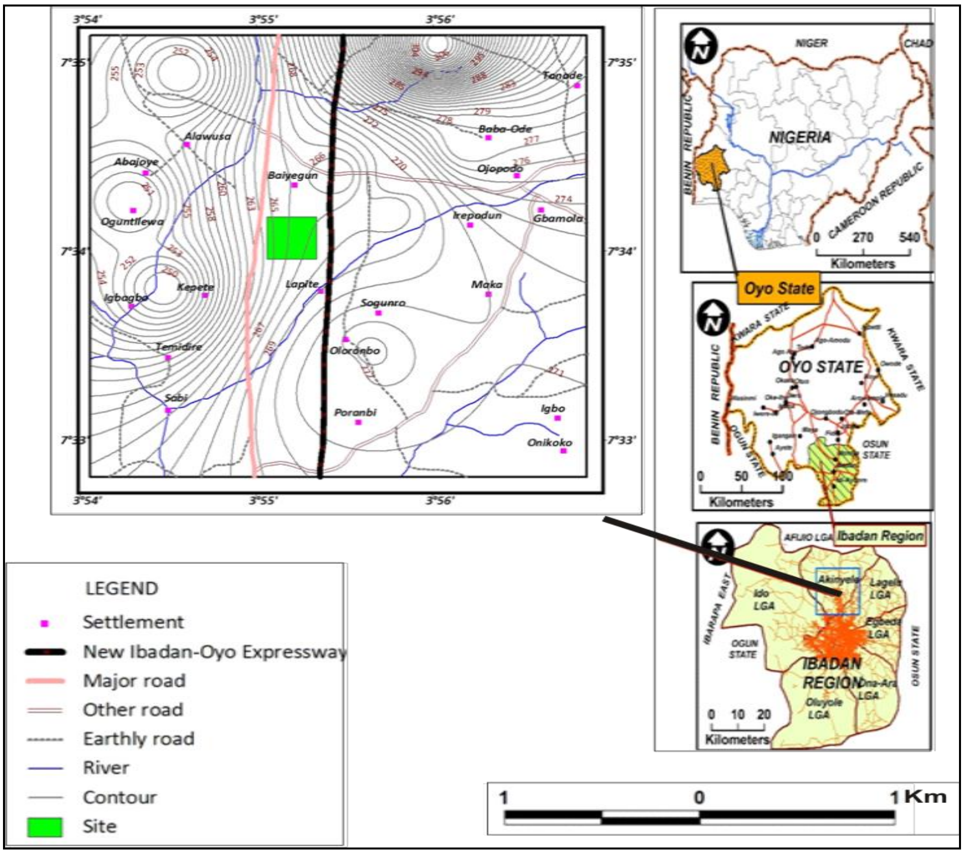

Figure 1: Location map of the study area, Ibadan city (showing Lapite dumpsite), Nigeria.

Sample Collection, Preparation and Analysis

Sample locations were chosen following the procedure described by Akintola, (2014). The location sites were dumpsite, downslope and upslope sides (0-100 m from the dumpsite). Ten disturbed soil samples were collected from each location at 10m intervals and at the depth of 0-20 cm using auger and labeled accordingly. 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 soil samples were taken to the laboratory and analyzed for both physical and chemical characteristics. The physical analyses (such as moisture content, grain sixe distribution, bulk density and soil porosity tests) and chemical analyses (such as electrical conductivity, pH, organic matter content, total nitrogen, available phosphorus, Na, K, Ca, Mg, Fe, Cu, Zn, Pb and Mn) were conducted on the collected soil samples.

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 weight of the dry soil. Grain size distribution test was conducted using hydrometer method following Brown (2003), while bulk density of the soils was determined using a method described by Blake and Harge (1986) in which the undisturbed core samples were dried to a constant weight at 105C and then divided by its volume. The porosity of the soil samples were determined by saturation method as described by Matko,

(2003) and measured by dividing the amount of water added to the soil samples by total volume of the soil samples, multiplied by 100.

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 Walkely and Black (1934) method 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 (Bramner, 1965) and electro-photometer method (Bray and Kurtz, 1945) 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).

Data Analysis

Data were analyzed using correlation coefficients and Analysis of variance for determination of variability among the study locations and the analytical parameters while the means were separated using Duncan Multiple Range tests (DMRT). The statistical software package used was IBM SPSS 20.0 version. The results were presented in tabular forms.

RESULTS AND DISCUSSION

Effect of Waste Dump on Physical Properties of Soil

The minimum, maximum and mean values soil physical properties from the three location sites in and around the waste dumpsites were presented in Table 1.

Table 1: Physical characteristics of the soil samples.

Location site	Statistical parameters	Clay (%)	Silt (%)	Sand (%)	Moisture Content (%)	Bulk density (g/cm^3)	Porosity (%)
Dumpsite	Minimum	10.00	19.00	66.00	21.22	1.01	66.21
	Maximum	13.00	21.00	71.00	38.11	1.26	74.56
	Mean	11.00^a	20.00^a	69.00^a	35.22^a	1.11^c	71.22^a
Downslope	Minimum	9.00	27.00	57.00	19.11	1.21	55.88
Side of the dumpsite	Maximum	13.00	30.00	64.00	28.65	1.39	62.01
	Mean	10.00^a	29.00^a	61.00^a	23.67^b	1.30^b	60.55^b
Upslope side of the dumpsite	Minimum	9.00	18.00	64.00	18.05	1.37	49.09
	Maximum	11.00	25.00	73.00	19.34	1.54	54.21
	Mean	10.50^a	24.00^a	65.50^a	18.03^c	1.41^a	51.88^c

The particle size distribution characteristics of the soil showed that sand has the highest percentage value ranging from 57.00 to 73.00 %, silt has values between 18.00 and 25.000 % while clay has the lowest value ranged from 9.00 to 13.00 %. There were no significant differences in the mean values of clay, silt and sand among the three location at P<0.05 and this indicated that the wastes have no effect on the texture of the studied soils samples but may affect the structure of the soil in time of firmness due to the presence of organic matter from the deposition of wastes. Percentage of sand, silt and clay in soils from the dumpsite, downslope and upslope indicated that they have loamy sand and sandy loam texture. Indorial et al., (2017) stated that the nature and quality of soil structure are strongly affected by the quantity and quality of organic matter in the soil. Thus, soils from the dumpsite will have more stable structure, high moisture content, water retention and porosity, low soil strength and bulk density and this in turn strengthen the root growth of the plants by moving the nutrients into the surface and subsurface soils (Gurber et al., 2014; Hatten and Lilles, 2019).

The moisture content values of the soils from dumpsite has the highest values ranging from 21.22 to 38.11 % with the mean value of 35.22 % followed by the soil collected from the downslope location which have its values ranging from 19.11 to 28.65 % with mean value of 23.67 % while those from the upslope side of the dumpsites have the lowest values ranging from 18.05 to19.34 with mean value of 18.03. However, significant differences were observed in their mean values at P < 0.05 (Table1).

The highest values of bulk density (1.37-1.54 g/cm^3) of the soils were recorded from upslope side of the dumpsite followed by the downslope soils (1.21-1.39 g/cm^3) while the dumpsite soils have the lowest bulk density values of 1.01 -1.26 g/cm^3. The highest porosity values were recorded from the dumpsite soils (66.21 to 74.56) while the lowest values were found in the soils collected from the upslope side of the dumpsite. It was observed that the bulk density of the soil decreases with increase in the moisture content and porosity of the soils. Significant differences were also notice in the mean values of the bulk density and the porosity of the soils from the three locations at P < 0.05.

Significant differences observed among the sampling locations with respect to moisture content, bulk density and porosity could be ascribed to the differences in soil organic matter content that enhances pore spaces and put soil aggregates together (Brevik, 2014). The significant lower bulk density and high porosity values recorded from the dumpsite soils when compared to other location sites is in line with similar work conducted by Njoku (2015) and Agbeshie et al., (2020). Also, significant high value of moisture content from dumpsite soils is in line with the finding of Njoku (2015). Thus, soils from dumpsite will be more beneficial to root penetration for firmness and support (Doran and Zeiss, 2000). Thus, the determined physical conditions from dumpsite soils are greatly affected when compared to soils from downslope and upslope due to the quality and quantity of organic matters present (Karmakar et al., 2016; Indorial et al., 2017) as a result of wastes decomposition.

Effect of Waste Dump on pH, Electrical Conductivity (EC), Organic Matter Content (OMC), Total Nitrogen (TN) and Available Phosphorus (AP)

The pH of the studied soils ranged from 6.68 to 8.88 (Table 2). Soils from dumpsite have the highest pH mean value of 7.85 followed by downslope soils (7.37) while upslope soils have the lowest value of 6.75. No significant different was noticed among the three locations.

The pH of the studied soils ranged from 6.68 (slightly acidic) to 8.88) moderately alkaline in nature. 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 is 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 1145.34 to1543.56 µS/cm with mean value of 1235.07µS/cm. Soils from the downslope location have the EC values ranging from 879.99 to 986.83 µS/cm while those from the upslope side of the dumpsite were between 389.22 and 588.73 µS/cm.

Table 2: Values of pH, Electrical conductivity (EC), Organic matter content (OMC), Total nitrogen (TN) and Available phosphorus (AP).

Location site	Statistical parameters	Ph	EC (µS/cm)	OMC (%)	TN (%)	AP (%)
Dumpsite	Minimum	7.72	1145.34	3.27	1.39	0.60
	Maximum	8.88	1543.56	5.98	1.66	1.09
	Mean	7.35[a]	1235.07[a]	4.11[a]	1.52[a]	0.89[a]
Downslope Side of the dumpsite	Minimum	7.23	879.99	1.78	0.85	0.39
	Maximum	7.67	986.83	2.89	1.02	0.51
	Mean	7.35[a]	919.96[b]	2.38[b]	0.98[b]	0.47[b]
Upslope side of the dumpsite	Minimum	6.68	389.22	1.39	0.58	0.35
	Maximum	6.91	667.09	1.81	0.72	0.43
	Mean	6.75[a]	588.73[c]	1.56[c]	0.65[c]	0.37[c]

The significantly high mean EC values in dumpsite soils when compared to the downslope and upslope soils is an indication of the presence of more cations and anions in the the dumpsite as a result of ionizable materials (Ahmed et al., 2014; Akintola, 2014; Mekonnen et al., 2020). The values of EC (389.22 - 1543.56 µS/cm) in the studied soils were lesser to similar studies conducted on dumpsites (Ahmed et al., 2014; Agbeshie, 2020, Mekonnem et al., 2020) and higher than those reported by Osazee et al., (2013) and Enerijiofi and Ekhaise (2019). The reason for this could be due to the age of the dumpsites, waste types, and study locations.

Soil samples from the three studied locations have the organic matter content contents ranged from 1.39 to 5.89%, total nitrogen values from 0.58 to1.66% and available phosphorus from 0.35 to 1.09 %. Highest mean values of OMC, TN and AP were observed from soils collected from dumpsite. Significant differences were also observed among the studied locations for electrical conductivity, organic matter content, total nitrogen and available phosphorus at $P<0.05$. Significant higher mean values of organic matter content (OMC), total nitrogen (TN) and available phosphorus (AP) observed from dumpsite soils when compared to downslope and upslope soils is due to the decomposition of organic wastes by soil microbial activities that has led to increase in the soil organic matter contents which serve as major source of nitrogen and phosphorus for plant growth (Obute et al., 2010, Amos-Tautua et al., 2014). High values of OMC, TN and AP recorded from dumpsite soils when compared with the other two location sites were in line with the results of previous researchers (Obianefo et al., 2017; Agbeshie et al., 2020). According to Amos-Tautua et al., (2014), the high organic matter content from waste dumpsite soils will have significant influence on soil bulk density, moisture content, porosity, availability of nutrients and plant growth.

Effect of Waste Dump on Determined Elements in the Soil Samples

Calcium had the highest mean concentrations among the exchangeable cations in the studied soil samples. Concentrations of Ca were higher in the dumpsite soils with mean value of 234.89 mg/kg than down slope (104.68 mg/kg) and upslope soils (71.22 mg/kg) soils. The mean concentration of Mg in the soils from dumpsite was 121.85 mg/kg while those from downslope and upslope soils were 60.02 and 27.43 mg/kg respectively. The respective mean concentrations of Na and K in soils from dumpsite were 189.09 and 54.56 mg/kg, downslope (101.01 and 36.09 mg/kg) and upslope soils (48.99 and 19.87 mg/kg) as presented in Table 3. Significance higher values of exchangeable cations were recorded from dumpsite soils than the two other location sites at $P<0.05$. The values of exchangeable bases (Na. K, Ca and Mg) in the studied soils from various locations followed the same trends to that of organic matter contents, total nitrogen and available phosphorus. Generally, the dumpsite soils showed higher significant values ($p\leq0.05$) of Na, K. Ca and Mg followed by downslope and upslope soils. 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 (Table 3). Iron (Fe) showed significantly higher mean concentration value in the soil from dumpsite (34720.01 mg/kg) than downslope (22102.28 mg/kg) and upslope (22455.27 mg/kg) soils. The respective mean concentration values of Zn, Cu, Pb and Ni in the soils from dumpsite soils were 237.51, 258.11, 165.65 and 26.11 mg/kg while those from the downslope soils were Zn (106.22 mg/kg), Cu (91.31mg/kg), Pb (66.01 mg/kg) and Ni (18.96 mg/kg). However, lower mean concentration values of Zn (41.51 mg/kg), Cu (39.71 mg/kg), Pb (28.05 mg/kg) and Ni (11.50 mg/kg) were recorded from the upslope soils (Table 3). The concentrations of the micro nutrients in the soil samples were in order of Fe > Zn > Cu > Pb > Ni. Significant higher mean values of heavy metals were also recorded from dumpsite soils at $P < 0.05$.

Heavy metals concentrations in soils are in order of Fe > Zn > Cu > Pb> Ni. 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 (Brady, 1984; Vecera et al., 1999) as shown in Table 5. The relatively higher concentrations of Fe in the studied soil may be attributed to it 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 5. Highest Zn concentrations recorded from the dumpsites could be attributable to deposition of materials that are rich in heavy metals such as used battery, electronic matteisl 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). Significant differences in 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). Concentration 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 little higher than those given by Kabata-Pendias and Pendias, (1984), Alloway, (1996) and Vecera et al., (1999) while Ni concemntrations were within the recommended values given by Bowen, (1979); FAO/WHO, (2001) and Vecera et al., (1999).

Generally, the higher concentrations of heavy metals in dumpsite than the downslope and upslope 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: Concentrations of determined elements in the soil.

Location site	Statistical parameters	Na	K	Ca	Mg	Fe	Zn	Pb	Cu	Ni
Dumpsite	Minimum	187.21	45.89	200.11	120.02	33301.13	278.21	149.29	229.15	25.75
	Maximum	199.56	61.23	259.22	126.99	35102.41	437.25	205.29	286.67	35.90
	Mean	189.09[a]	54.56[a]	234.89[a]	121.85[a]	34720.01[a]	237.51[a]	165.65[a]	258.11[a]	26.11[a]
Downslope Side of the dumpsite	Minimum	91.81	31.22	91.89	59.65	23071.32	50.24	35.24	46.01	13.11
	Maximum	110.76	42.77	152.89	61.58	31807.56	120.44	82.72	112.43	19.34
	Mean	101.01[b]	36.09[b]	104.68[b]	60.02[b]	22102.89[b]	106.22[b]	66.01[b]	91.31[b]	18.96[b]
Upslope side of the dumpsite	Minimum	42.78	18.56	66.56	25.56	22399.07	36.29	23.02	35.20	10.82
	Maximum	51.66	23.11	84.67	32.09	22623.18	48.65	32.61	44.41	12.98
	Mean	48.99[c]	19.87[c]	71.22[c]	27.43[c]	22455.27[b]	41.51[c]	28.05[c]	39.71[c]	11.50[c]

Table 4: Pearson's Correlation Coefficient.

Parameters	Parameters													
	pH	EC	OMC	TN	AP	Na	K	Ca	Mg	Fe	Zn	Pb	Cu	Ni
pH	1	.972**	.951**	.953**	.956**	.900*	.982**	.961**	.884*	.886*	.939**	.943**	.932**	.968**
EC		1	.868*	.969**	.895*	.938**	.981**	.952**	.929**	.878*	.913*	.929**	.916*	.944**
OMC			1	.839*	.975**	.742**	.881*	.869*	.726**	.761**	.882*	.859*	.852*	.907*
TN				1	.907*	.985**	.973**	.990**	.979**	.925**	.973**	.987**	.982**	.983**
AP					1	.826*	.898*	.922**	.822*	.796*	.956**	.931**	.931**	.961**
Na						1	.947**	.964**	.996**	.921**	.937**	.962**	.958**	.942**
K							1	.978**	.926**	.944**	.928**	.952**	.938**	.962**
Ca								1	.949**	.956**	.976**	.993**	.987**	.992**
Mg									1	.886*	.937**	.955**	.953**	.933**
Fe										1	.883*	.930**	.916*	.918**
Zn											1	.993**	.996**	.992**
Pb												1	.999**	.994**
Cu													1	.992**
Ni														1

\ ***. Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).*

Table 5: Comparison of Metal Levels in this Study with the Levels Recommended by Some Researchers

Authors	Fe	Zn	Pb	Cu	Ni
Kabata-Pendias and Pendias (1984)	-	-	30 – 300	250	-
Brady(1984)	26000	--	19	25	19
Bowen, (1979)	100-700	100	2-200	300	50
FAO/WHO, (2001)	100-1000	300	50	300	-
Alloway, (1996)	-	1-900	2-300	2-200	-
Vecera et al (1999)	100-700	10-300	2-200	2-100	10-100
This study	22399.07-35102.41	36.29 - 437.25	23.02-205.29	35.20-286.67	10.82-35.90

Correlation Analysis

Relationships among the determined parameters were presented in Table 4. The pH was positively, strongly and significantly correlated with electrical conductivity (0.972), organic matter content (0.951), total nitrogen (0.953), available phosphorus (0.956), Na (0.900), K (0.982), Ca (0.961), Mg (0.884), Fe (0.886), Zn (0.939), Cu (0.932), Pb (0.943) and Ni (0.968) at $P \leq 0.05$. Organic matter content (OMC) also showed positive, strong and significant relationship with total nitrogen (0.839), available phosphorus (0.975), Na (0.742), K (0.881), Ca (0.869), Mg (0.726), Fe (0.761), Zn (0.882), Cu (0.852), Pb (0.859) and Ni (0.907). Sodium (Na) was strongly and positively correlated with K (0.947), Ca (0.964), Mg (0.996), Fe (0.921), Zn (0.937), Pb (0.962), Cu (0.958) and Ni (0.942). Fe correlated positively and significantly with Zn (0.886), Pb (0.937), Cu (0.955) and Ni (0.953).

CONCLUSION

This study has assessed some physical and chemical properties of soil in and around Lapite dumpsite. The study revealed that the deposition and decomposition of wastes has led to significant impact on soil pH, bulk density, moisture content, porosity, electrical conductivity, exchangeable bases and heavy metals (Fe, Zn. Pb, Cu and Ni). However, no remarkable impact was noticed on the texture of the soils. The high 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 sand fraction is dominant on site and such type of soil is not recommended for dumping site due to high infiltration rate However, increase in heavy metal concentrations form 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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