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Determination of Heavy Metals and Essential Minerals Concentration in Roadside Soil along Igbesa-Lusada During Rainy and Dry Season

[1,2]Sholotan Kazeem J., [1]OlufunkeAkinkurolere, [1]Ajayi Babasola J., [1]Ajimalufin Akorede I., [1]Olabode Oluwaseyi M. and [1]Usman Folasade B.
[1]*Ogun State Institute of Technology Igbesa, Ogun State.*
[2]*Federal University of Technology Akure, Ondo State*

Abstract: *Concentrations of six typical heavy metals and three essential minerals in roadside soils along Igbesa to Lusadawere investigated in this study. Soil samples of both dry and wet season were obtained and analyzed to determine the following parameters (Lead (Pb), Copper (Cu), Nickel (Ni), Zinc (Zn), Chromium (Cr), Manganese (Mn), Nitrogen (N), Phosphorous (P), and Potassium (K)). A total of twenty eight soil samples were collected with fourteen samples for each season. Two samples of soil were collected at both sides of the seven different collection pointsstarting from China junction in Igbesa to Lusada market with proper labelling. The samples were digested using wet method and the heavy metals and essential mineral (K) were analyzed using an Atomic Absorption Spectrophotometer while Nitrogen and Phosphorus were analyzed using Spectrophotometry method. Mean concentration of Lead (Pb) in soil along the roadside was found between 8.0-23.2mg/kg during dry season and 7.75-16.8mg/kg in wet season; Cadmium (Cd) was between 0.00-3.81mg/kg during dry season and 0.00-2.00mg/kg in wet season; Copper (Cu) was between 4.12-8.00mg/kg during dry season and 5.56-38.4mg/kg in wet season; Nickel (Ni) was between 0.31-0.91mg/kg during dry season and 0.08-0.84mg/kg during wet season; Zinc (Zn) was between 99.7-122.8mg/kg during dry season while wet season was between 117.2-231.7mg/kg while Chromium (Cr) was detected between 1.03-2.96mg/kg during dry season and 4.93-11.3mg/kg during wet season. Nitrogen (N) was detected between 0.10-0.15mg/kg during dry season and 0.04-0.26% during wet season while Phosphorus (P) was found to be 94.6-361.6mg/kg during dry season and 50.0-263.2mg/kg in wet season. Potassium (K) an essential element was found to be 482.6-788.8mg/kg during dry season and 145.5-834.4mg/kg in wet season. Based on this study, the mean values of soil alongIgbesa to Lusadaroad were found with high concentration of heavy metals and essential minerals compared to that of WHO which can possibly pose a health risk to the living things most particularly human inhabiting or plying that environment by damaging of liver, nervous system, and other vital organs in the body.*

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I. Introduction

Good roads perform a vital role in encouraging social and economic activities, such as roads construction, movement of vehicles, transportation of heavy metals, and traffics which have resulted in environmental pollution, especially those that are caused by heavy metals (Bai, *et al.,* 2010).

Heavy metals are defined as any metallic element that are toxic in nature and has a relatively high densities, specific gravity or atomic weight, metallic luster, high thermal conductivity, high electrical conductivity, thermal stability and are non-biodegradable (Abbas, *et al.,* 2008). Most heavy metals are located in the center of the periodic table between group four to twelve, which are known as transition elements, example of such heavy metal include; Cadmium(Cd), Chromium (Cr), Copper (cu), Lead (Pb), Nickel (Ni), and Zinc (Zn) e.t.c, that may exist as natural component of the earth crust through weathering of bedrocks while some are through human anthropogenic activities such as energy production, road construction, traffics, oil spillage, fuel combustion, corrosion of batteries, mechanic workshop, and industrial wastes, which are highly poisonous in nature and have resulted into diverse effect to living organism in the environment such as brain dysfunction, kidney, reproductive, nervous and gastrointestinal tract damages (Skoog*et al*., 2008).Road accessibility also create varieties of ancillary employment such as vehicle repair, vulcanizers, welder, auto electricians and battery chargers whereby, these activities most times leads to deposition of heavy metals into nearby soils, which can generate airborne particles and dusts that may possibly affect the air quality and also contaminate roadside vegetation's, wildlife, domestic animals and the human settlements (Gray *et al.,* 2013).

Heavy metals are non-biodegradable and accumulative in nature they can remain in the soil for extended periods because they degrade slowly however, the prolonged presence of this contaminant can

severely pose a risk to the ecosystem and threatening human and animal's health even at lower concentrated values through exposure pathways such as inhalation of dusts, ingestion of food (crops grown in soil or road side, food exposed to dust) and through dermal contact (Nath, 2013).

Soil does not only contain heavy metals but also essential nutrient such as nitrogen, phosphorous and potassium e.t.c. these minerals are required by plants for proper growth and also balance crop nutrition and are basically known as macronutrient such as Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, and Sulphur, but the most important of it are Nitrogen (N), Phosphorus (P), and Potassium (K) (Viuf, 2009). Essential minerals are important in the soil because they aid plants growth by increasing soil fertility and productivity which enable plant to carry out their normal activities effectively. They are the building blocks of life that plant required for healthy and optimum growth, without these minerals, plant cannot survive to their full potentials, but rather provide lower yield, and be more susceptible to disease (Li, *et al*., 2017).

The availability ofN, P, K, in the soil should be at appropriate level to support plant growth, cause low or high concentrations of these essential minerals result in an adverse effects to plants such as; yellowing of leaves, or the occurrence of brown spot on the leaf, stunted growth e.t.c. (Brown, *et al.,* 2014).

Elevated heavy metals decreases soil fertility which inhibit the productivity and photosynthesis of plant even at low concentrations which may possibly result into symptoms like dark green leaves, wilting of older leaves, stunted foliage and brown short leaves and also contaminated of food crops.

Uptake of heavy metals by plant and subsequent accumulation along the food chain is a potential threat to human and animal's health such that consumption of foods contaminated by heavy metals seriously deplete some essential nutrients in the food which are responsible for decreasing immunological defenses, intrauterine growth retardation, disabilities associated with malnutrition, high prevalence of upper gastrointestinal cancer rates, brain dysfunction, kidney damages, respiratory, reproductive and nervous system damages.

The release of heavy metals to the environment from industries and human anthropogenic activities such as, vehicle exhaust, oil spillage, road construction e.t.c, has pose a risk to plants, human and animal's health through inhalation, ingestion of contaminated foods by heavy metals and through dermal contact. This has actually intrigued the action to determine the concentration of these heavy metals and essential minerals along the road side soil.

II. Materials And Method

Sampling Site

The study was carried out alongIgbesa-Lusada road located in Igbesa/Agbara Local Council Development Area in Ado OdoOtta Local Government Area of Ogun-State, Nigeria. The collection sites constitute different seven points, from China road to Lusada. The samples were taken at P_1 to P_7 junctions. The soil sample location for P_1 lies between latitude 6^o550.476"N and longitude 3^o126.688"E; P_2 lies between latitude 6^o551.340"N and longitude 3^o116; while latitude P_3, P_4, P_5 and P_6 the soil samples location lies between latitude 6^o566.195"N and longitude 3^o102.619"E, latitude 6^o570.582"N and longitude 3^o097.969"E, latitude 6^o586.095"N and longitude 3^o085.675"E, latitude 6^o554.036"N and longitude 3^o124.829"E respectively. Lastly the soil sample location for lusada lies between latitude 6^o583.525"N and longitude 3^o084.696"E. The activities going on along this road includes residential, market, farming, vehicles and heavy trucks plying the road. The locations is as captured in table 1 below

Table 1: Geographical coordinates of sampling points

Study area	Sample soil	Latitude	Longitude
P1	Soil	6^o550.476"N	3^O126.688"E
P2	Soil	6^o556.340"N	3^O116.561"E
P3	Soil	6^o556.195"N	3^O102.619"E
P4	Soil	6^o570.582"N	3^O097.060"E
P5	Soil	6^o586.095"N	3^O085.675"E
P6	Soil	6^o554.036"N	3^O124.829"E
P7	Soil	6^o583.525"N	3^O084.696"E

Sample Collection

The soil samples were collected from different locations selected during dry and rainy season. The samples were collected with a trowel and transferred into a clean polythene bag, each of the samples were labeled appropriately. Physicochemical parameters were carried out successfully and the remaining sample was transferred to SMO Laboratory Consult located at Ibadan-State Nigeria for analysis of heavy metals and essential minerals using Atomic Absorption Spectrophotometer (AAS) and Spectrophotometer, for the

assessment of soil quality. Collection of samples was done during dry season; September to November, 2018 and during rainy season; February to April, 2019. The selected heavy metals and essential minerals (N, P, K, Pb, Cd, Cu, Ni, Zn and Cr) were properly analyzed using AAS and Spectrophotometer.

Sample Digestion

Wet digestion

Digestion procedure used to determine these heavy metals was recommended by Association of Agricultural Chemistry (AOAC) as described by Omojola, (2011). The soil sample was air-dried and sieved with sieve of 2mm into fine particles. 3g of the sieved soil sample were weighed with an analytical weighing balance and was poured into 100ml beaker. 10ml of the concentrated mixture of nitric and sulfuric acid in ratio 1:1 (V/V) was added to the weighed soil sample and was placed in a fumes cupboard on a heating mantle to be heated at 100c for 2-3 hours until a clear fumes/solution were obtained. Distilled water was added to the clear solution and was filtered with a whatman filter paper into a known volumetric flask of 50ml. Then the heavy metals were analyzed with an automated atomic absorption spectrophotometer (AAS-3700 model).

Kjeldahl digestion

0.5g of sieved air-dried soil sample was weighed and was transferred into kjeldahl flask. 2g of selenium tablet and 10ml of H_2SO_4were deposited into the kjeldahl flask containing weighed soil sample. The sample was placed in the fume cupboard on a hot plate to heat at 300^oC for days until a colorless liquid was obtained. Distilled water was added then it was stayed to cool and filtered with a whatman filter paper into a volumetric flask for analysis. Then the digested sample was analyzed for Nitrogen and Phosporus using an absorbance Spectrophotometer Model 6305.

III. Results

The concentration of heavy metals in roadside dust samples from commercial area is as Presented in Figure1. The concentration of Cr ranged from 1.23 to 8.22mg/kg, 2.34 to 20.12mg/kg Pb, 1.98 to 10.34mg/kg Cu, 3.45 to 34.23mg/kg Fe, 4.34 to 14.34mg/kg Ni, 0.88 to 7.87mg/kg Co, 1.09 to 6.34mg/kg Mn, 1.54 to 9.23mg/kg Cd, 0.19 to 3.98mg/kg As, and 2.34 to 32.44mg/k. Figure2 shows the mean concentrations of some heavy metals in roadside dust samples from residential area. The concentration of heavy metals in roadside dust samples from residential area is as shown in Figure2. The concentration ranged from 0.11 to 3.22mg/kg for Cr, 0.21 to 5.23mg/kg for Pb, 0.01 to 2.10mg/kg for Cu, 0.23 to 6.23mg/kg for Fe, 0.11 to 2.12mg/kg for Ni, 0.34 to 2.14mg/kg for Co, 0.02 to 1.02mg/kg for Mn, 0.13 to 1.22mg/kg Cd, 0.21 to 2.88mg/kg for Zn, and 0.12 to 6.33mg/kg.

Table 2: Concentration of Heavy Metal and Essential Mineral Result During Dry Season

Sample Site			PARAMETER (mg/kg)								
			N%	P	K	Pb	Cd	Cu	Ni	Zn	Cr
P1	D	R	0.114	265.51	809.64	11.875	0.625	7.875	0.050	95.675	0.700
		L	0.154	170.91	685.08	14.375	1.625	6.375	0.588	106.84	1.375
P2	D	R	0.081	143.44	653.9	5.375	0.000	8.000	0.588	109.69	1.000
		L	0.531	579.83	923.82	18.000	1.000	7.000	1.250	104.36	2.875
P3	D	R	0.083	146.49	695.46	7.625	0.000	7.000	0.963	98.78	0.713
		L	0.120	131.23	602.04	8.500	0.000	5.875	0.600	100.95	1.750
P4	D	R	0.079	161.75	539.76	17.625	0.000	5.250	0.378	116.95	1.250
		L	0.073	192.27	529.38	5.625	5.000	6.000	0.988	100.44	2.125
P5	D	R	0.066	119.02	498.24	11.500	0.000	5.875	0.488	106.13	1.075
		L	0.025	70.19	467.10	5.500	0.000	2.375	0.638	114.18	1.125
P6	D	R	0.097	177.01	736.98	11.500	1.250	7.750	0.813	123.39	2.500
		L	0.036	164.80	705.84	10.500	1.375	6.250	0.688	122.29	1.500
P7	D	R	0.125	201.42	788.88	3.875	3.375	8.875	0.000	80.975	0.925
		L	0.174	79.35	570.90	12.125	4.250	7.125	1.500	127.93	5.000

Table 3: Mean value of Heavy Metals and Essential Minerals During Dry Season

Location	N	P	K	Pb	Cd	Cu	Ni	Zn	Cr
P1	0.13	218.2	747.3	13.1	1.12	7.12	0.31	101.2	1.03
P2	0.3	361.6	788.8	11.6	0.5	7.5	0.91	107	1.93
P3	0.1	277.7	648.7	8.06	0	6.43	0.78	99.6	1.23
P4	0.07	177	534.5	23.2	2.5	5.62	0.68	108.7	1.68
P5	0.04	94.6	482.6	8.5	0	4.13	0.56	110.1	1.1
P6	0.07	341.8	721.4	11	1.13	7	0.75	112.8	2
P7	0.15	140.3	679.8	8	3.8	8	0.75	104.5	2.96

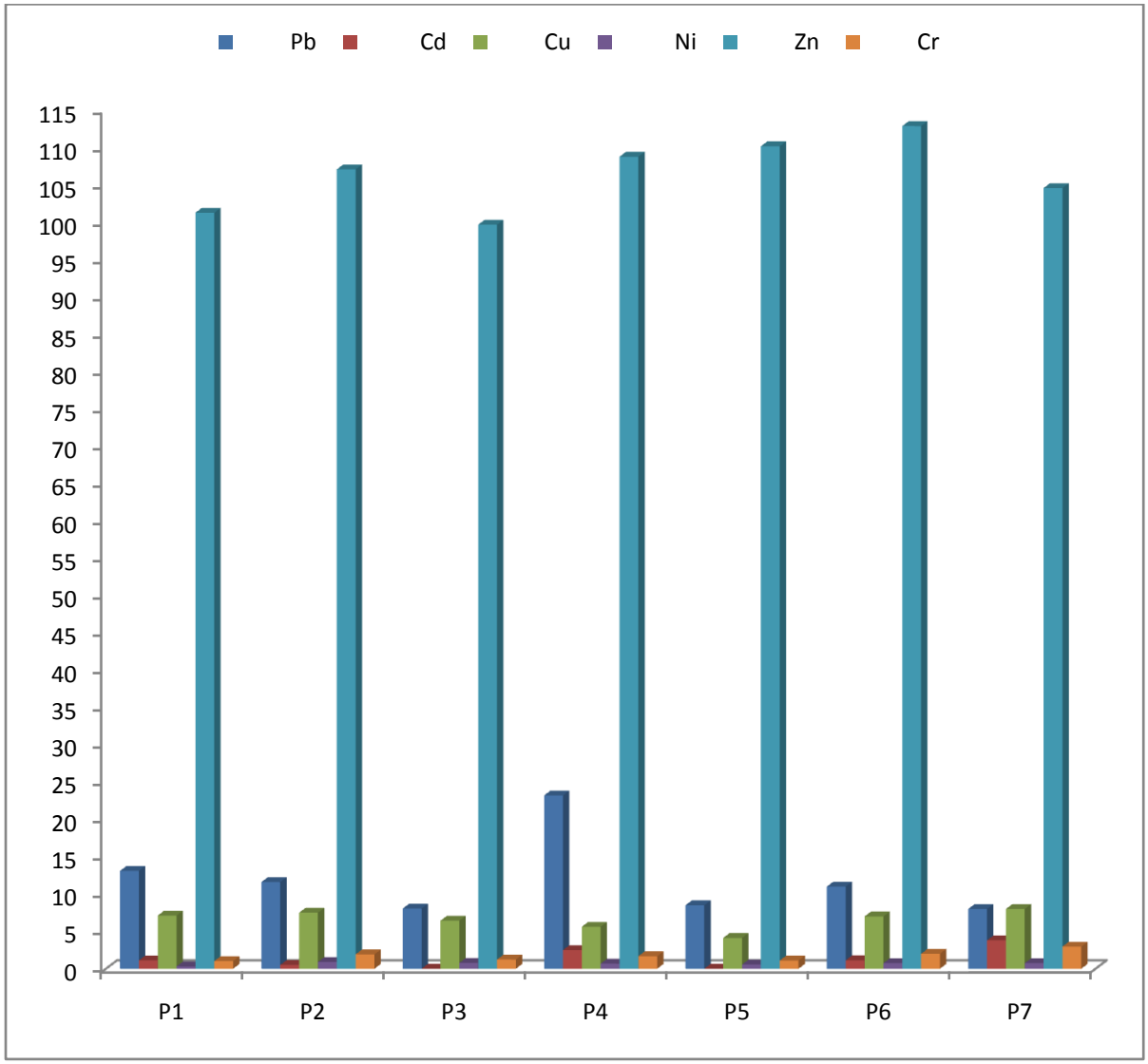

Figure 2.2: Mean Concentration (mg/kg) of Heavy metals across Sample Locations during Dry Season

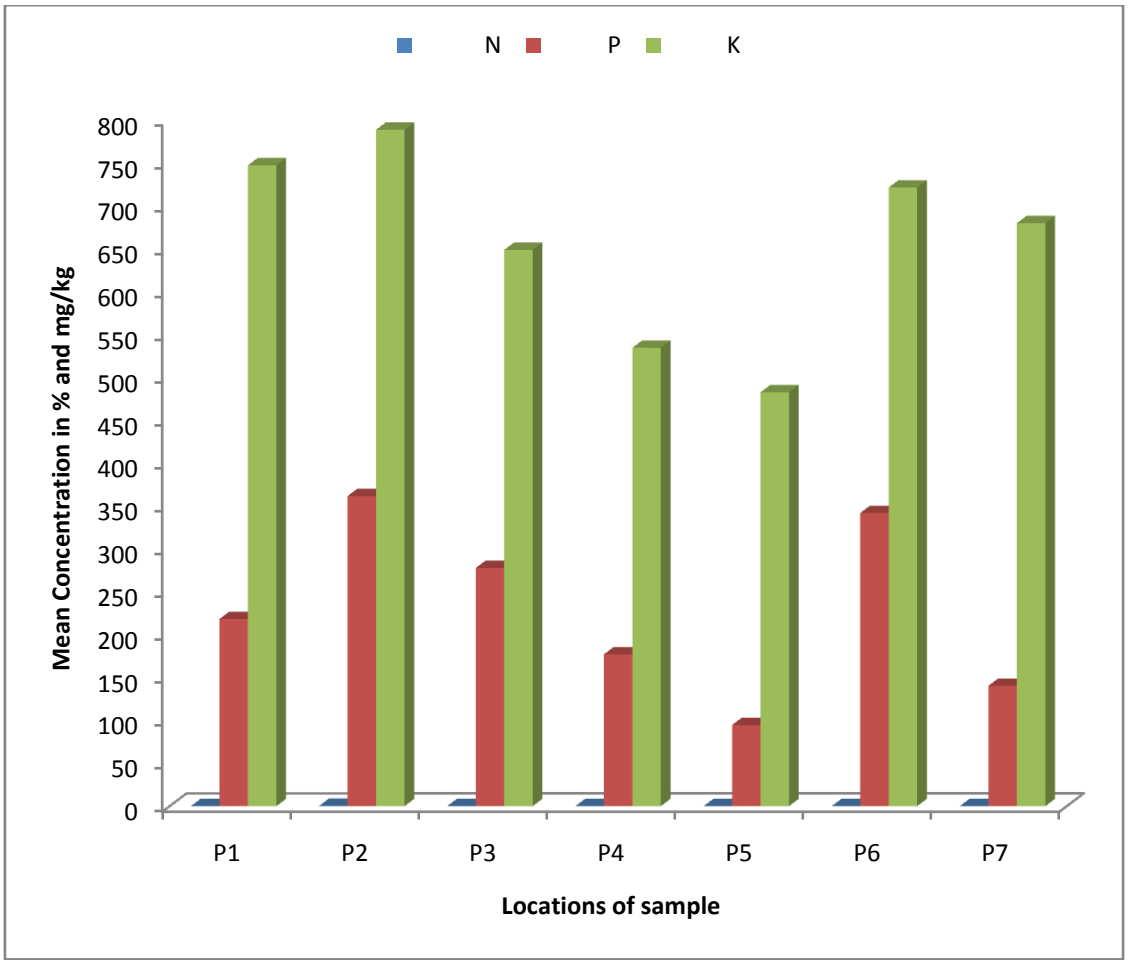

Figure 2.2: Mean Concentration of Essential Minerals across Sample Locations

Table 4: Concentration of Heavy Metal and Essential Mineral Result During Wet Season

Sample Site			PARAMETER (mg/kg)								
			N%	P	K	Pb	Cd	Cu	Ni	Zn	Cr
P1	W	R	0.076	226.2	711.25	7.125	0.000	7.750	0.087	102.15	2.875
		L	0.137	300.36	869.14	20.125	0.000	11.875	0.135	132.21	7.000
P2	W	R	0.063	122.37	967.75	9.125	0.000	12.750	0.065	119.83	10.125
		L	0.028	44.68	701.13	6.375	0.000	9.625	0.100	186.45	8.125
P3	W	R	0.046	70.45	622.13	5.250	0.000	5.875	0.079	175.43	8.250
		L	0.061	29.67	740.96	19.750	0.000	5.250	0.118	176.87	4.750
P4	W	R	0.219	237.32	493.75	22.000	2.063	5.625	0.121	232.34	9.625
		L	0.309	4412.7	2419.4	11.625	1.938	71.250	1.562	231.12	13.00
P5	W	R	0.039	11.12	710.45	7.750	0.000	4.625	0.115	117.65	5.000
		L	0.142	92.70	602.38	10.625	1.338	7.875	0.102	198.78	12.250
P6	W	R	0.038	37.08	503.63	14.00	0.000	4.125	0.107	143.34	5.625
		L	0.047	148.33	770.25	10.127	0.575	7.200	0.127	109.95	9.500
P7	W	R	0.092	100.12	730.75	6.875	0.000	5.000	0.096	159.45	6.750
		L	0.052	44.5	612.25	19.375	0.000	6.625	0.145	124.56	6.125

Table 5: Mean Concentration of Heavy Metals and Essential Minerals During Wet Season

Location	N	P	K	Pb	Cd	Cu	Ni	Zn	Cr
P1	0.11	263.2	790.1	13.6	0	9.81	0.11	117.1	4.93
P2	0.04	83.5	834.4	7.75	0	11.1	0.08	153.1	9.12
P3	0.05	50	681.5	12.5	0	5.56	0.09	176.1	11.3
P4	0.26	234	145.5	16.8	2	38.4	0.84	231.7	8.62
P5	0.09	51.9	656.4	9.18	0.66	6.25	0.1	158.2	7.56
P6	0.04	92.7	636.9	12	0.28	5.66	0.11	126.6	6.43
P7	0.07	72.3	671.5	13.1	0	5.81	0.12	142	2.96

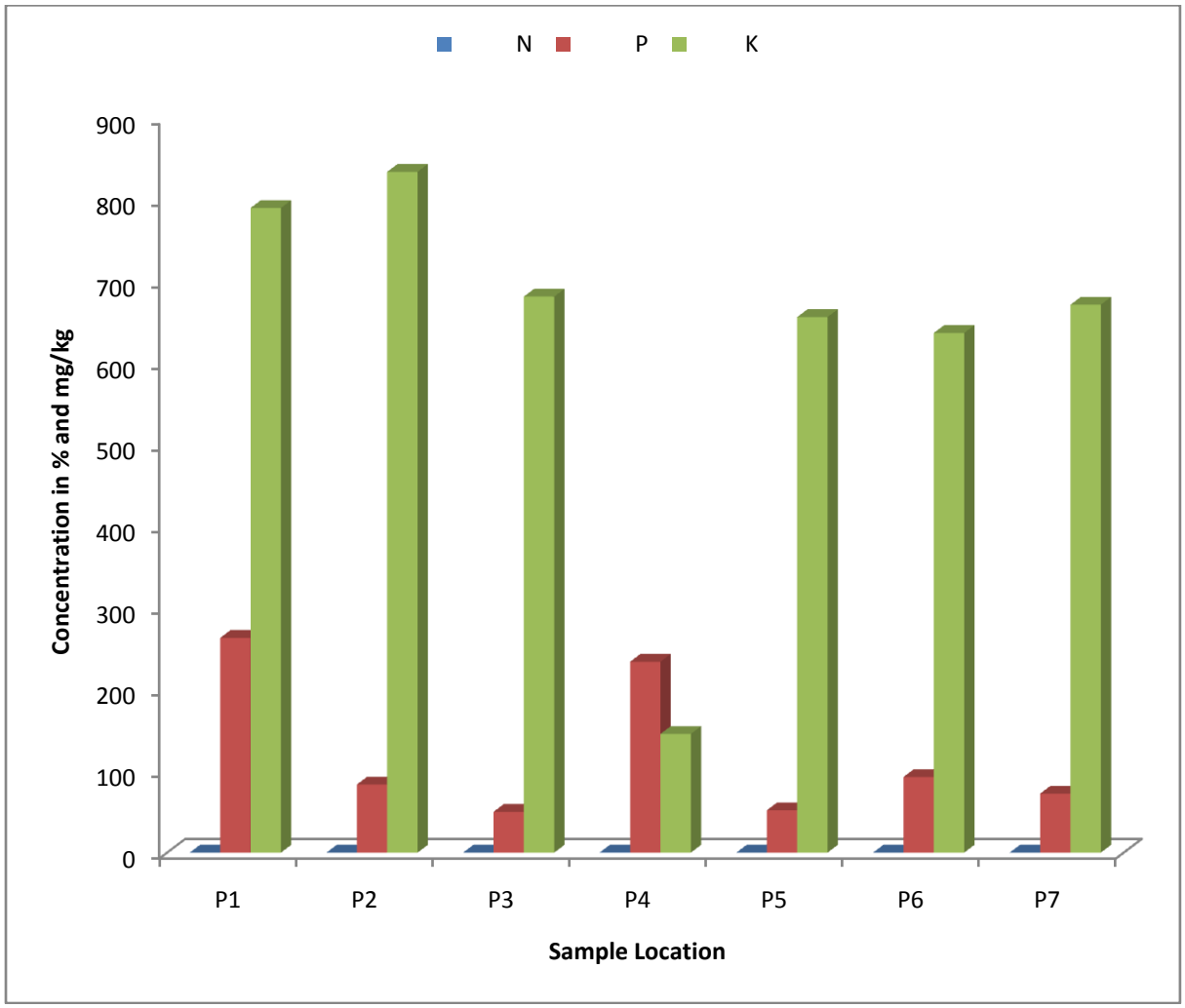

Figure 3.1: Mean Concentration of Essential Minerals of different Sample Location

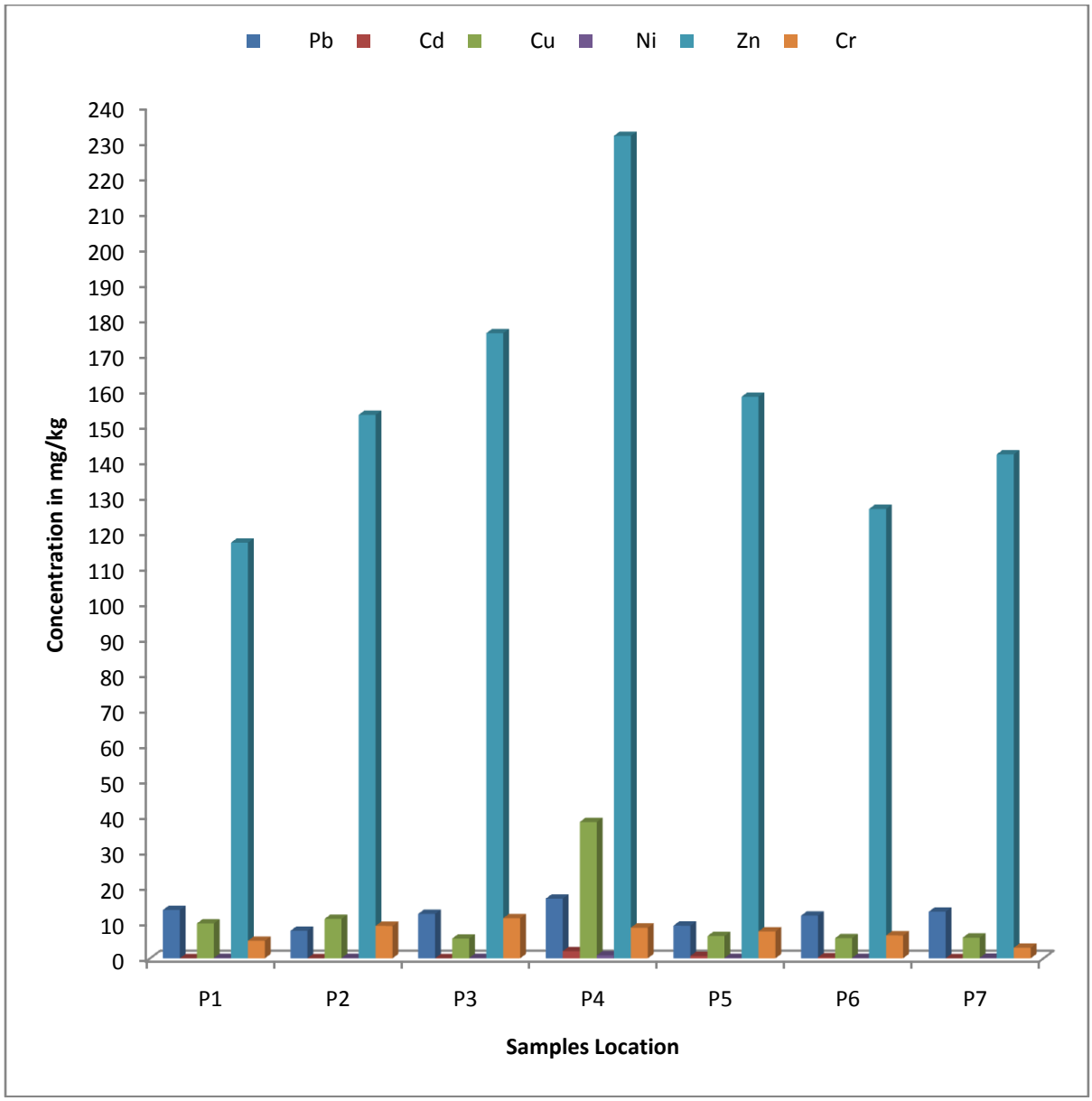

Figure 3.2: Mean Concentration of Heavy metals of different Sample Location

Table 6: Comparison of Heavy Metals and Essential Minerals Analysis on Road Side Soil AlongIgbesa-Lusada Road During Dry And Rainy Season And Permissible Standard Level Of **WHO.**

Sample Site			PARAMETER (mg/kg)								
			N%	P	K	Pb	Cd	Cu	Ni	Zn	Cr
P1	D	R	0.114	265.51	809.64	11.875	0.625	7.875	0.050	95.675	0.700
		L	0.154	170.91	685.08	14.375	1.625	6.375	0.588	106.84	1.375
	W	R	0.076	226.2	711.25	7.125	0.000	7.750	0.087	102.15	2.875
		L	0.137	300.36	869.14	20.125	0.000	11.875	0.135	132.21	7.000
P2	D	R	0.081	143.44	653.9	5.375	0.000	8.000	0.588	109.69	1.000
		L	0.531	579.83	923.82	18.000	1.000	7.000	1.250	104.36	2.875
	W	R	0.063	122.37	967.75	9.125	0.000	12.750	0.065	119.83	10.125
		L	0.028	44.68	701.13	6.375	0.000	9.625	0.100	186.45	8.125
P3	D	R	0.083	146.49	695.46	7.625	0.000	7.000	0.963	98.78	0.713
		L	0.120	131.23	602.04	8.500	0.000	5.875	0.600	100.95	1.750
	W	R	0.046	70.45	622.13	5.250	0.000	5.875	0.079	175.43	8.250
		L	0.061	29.67	740.96	19.750	0.000	5.250	0.118	176.87	4.750
P4	D	R	0.079	161.75	539.76	17.625	0.000	5.250	0.378	116.95	1.250
		L	0.073	192.27	529.38	5.625	5.000	6.000	0.988	100.44	2.125
	W	R	0.219	237.32	493.75	22.000	2.063	5.625	0.121	232.34	9.625
		L	0.309	4412.7	2419.4	11.625	1.938	71.250	1.562	231.12	13.00

P5	D	R	0.066	119.02	498.24	11.500	0.000	5.875	0.488	106.13	1.075
		L	0.025	70.19	467.10	5.500	0.000	2.375	0.638	114.18	1.125
	W	R	0.039	11.12	710.45	7.750	0.000	4.625	0.115	117.65	5.000
		L	0.142	92.70	602.38	10.625	1.338	7.875	0.102	198.78	12.250
P6	D	R	0.097	177.01	736.98	11.500	1.250	7.750	0.813	123.39	2.500
		L	0.036	164.80	705.84	10.500	1.375	6.250	0.688	122.29	1.500
	W	R	0.038	37.08	503.63	14.00	0.000	4.125	0.107	143.34	5.625
		L	0.047	148.33	770.25	10.127	0.575	7.200	0.127	109.95	9.500
P7	D	R	0.125	201.42	788.88	3.875	3.375	8.875	0.000	80.975	0.925
		L	0.174	79.35	570.90	12.125	4.250	7.125	1.500	127.93	5.000
	W	R	0.092	100.12	730.75	6.875	0.000	5.000	0.096	159.45	6.750
		L	0.052	44.5	612.25	19.375	0.000	6.625	0.145	124.56	6.125
WHO						0.5	2.0	1.5	3.5	99.4	1.30

Table 7: Mean Concentration of Heavy metals in Road side soil during Dry and Wet Season

Location	**Season**	**N**	**P**	**K**	**Pb**	**Cd**	**Cu**	**Ni**	**Zn**	**Cr**
P1	**W**	0.11	263.2	790.1	13.6	0	9.81	0.11	117.1	4.93
	D	0.13	218.2	747.3	13.1	1.12	7.12	0.31	101.2	1.03
P2	**W**	0.04	83.5	834.4	7.75	0	11.1	0.08	153.1	9.12
	D	0.3	361.6	788.8	11.6	0.5	7.5	0.91	107	1.93
P3	**W**	0.05	50	681.5	12.5	0	5.56	0.09	176.1	11.3
	D	0.1	277.7	648.7	8.06	0	6.43	0.78	99.6	1.23
P4	**W**	0.26	234	145.5	16.8	2	38.4	0.84	231.7	8.62
	D	0.07	177	534.5	23.2	2.5	5.62	0.68	108.7	1.68
P5	**W**	0.09	51.9	656.4	9.18	0.66	6.25	0.1	158.2	7.56
	D	0.04	94.6	482.6	8.5	0	4.13	0.56	110.1	1.1
P6	**W**	0.04	92.7	636.9	12	0.28	5.66	0.11	126.6	6.43
	D	0.07	341.8	721.4	11	1.13	7	0.75	112.8	2
P7	**W**	0.07	72.3	671.5	13.1	0	5.81	0.12	142	2.96
	D	0.15	140.3	679.8	8	3.8	8	0.75	104.5	2.96
WHO					0.5	2.0	1.5	3.5	99.4	1.30

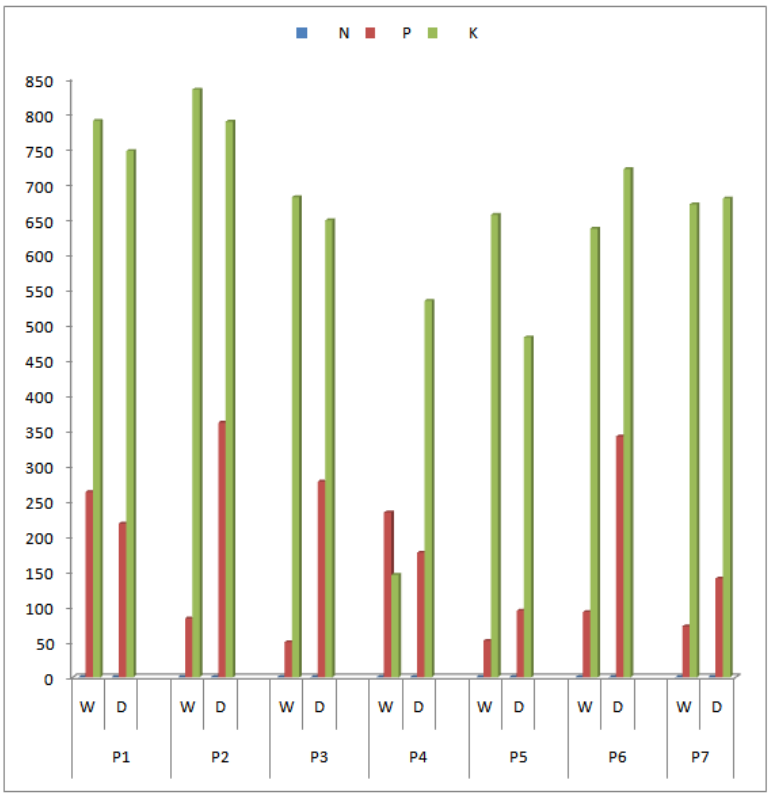

Figure 4.1: Mean Concentration of Essential Minerals of different Sample Location in both Seasons

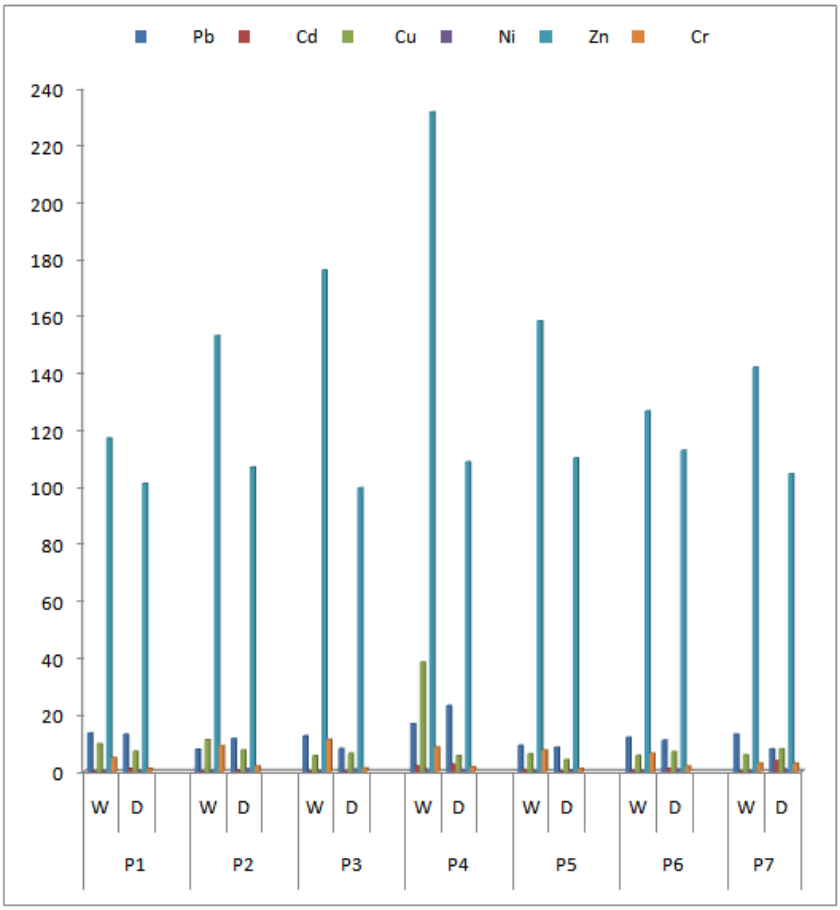

Figure 4.2: Mean Concentration of Heavy metals of different Sample Location in both Seasons

IV. Discussion

Lead (Pb)

The highest lead (Pb) concentration in the roadside soil was 23.2 mg/kg and was detected at P4 during dry season, while the wet season shows the least value of 16.8 mg/kg. P1 and P7 showed the lowest levels of lead 13.1 mg/kg; 8.00 mg/kg and 13.6 mg/kg; 13.1 mg/kg during dry and wet season respectively compare to the other point of sample collection. The concentrations of Pbspecified by WHO, (2004) ranges from 0.0 to 0.5 mg/kg. However, the Pb levels in this study (Igbesa to Lusada) exceed the base line limit specified by WHO; hence positing a contamination that requires remediation.

Cadmium (Cd)

The highest Cd concentration in the roadside soil was 3.80 mg/kg detected at P7 during dry season, while the wet season shows the least value of 2.00 mg/kg. The P1 and P7 vary in their concentration such as 1.12 mg/kg; 3.80 mg/kg and 0.00 mg/kg; 0.00 mg/kg during dry and wet season respectively as compared to the other point. The result of this study exceeds base line of0.5 to 2.0 mg/kgof Cd in the roadside samples as reported by WHO.

Copper (Cu)

The highest Cu concentration in the roadside soil was 8.0 mg/kg and was detected at P7 during dry season, while the wet season shows the value of 38.4 mg/kg. P1 and P7 vary in their mean concentration of Copper 7.12 mg/kg; 8.00 mg/kg and 9.81 mg/kg; 5.81 mg/kg during dry and wet season respectively compare to the other point of sample collection. The concentrations of Cu in these roadside samples exceeded baseline of 0.5 to 1.5 mg/kg as specified by WHO.

Nickel (Ni)

The highest Ni concentration in the roadside soil was 0.91 mg/kg and was detected at P2 during dry season, while the wet season shows the value of 0.84 mg/kg. P1 and P7 vary in their mean concentration of 0.31 mg/k; 0.75 mg/kg and 0.11 mg/kg; 0.12 mg/kg during dry and wet season respectively. The concentrations of Ni in these roadside samples were below the baseline of1.0 to 3.5 mg/kg reported by WHO.

Zinc (Zn)

The highest Zn concentration in the roadside soil was 112.8 mg/kg and was detected at P6 during dry season, while the wet season shows the value of 231.7 mg/kg. The P1 and P7 vary in their mean concentration of Zinc 101.2 mg/kg; 104.5 mg/kg and 117.1 mg/kg; 142.0 mg/kg during dry and wet season respectively. The concentrations or baseline specified by WHO for Zn in roadside soil samples is 99.4 mg/kg but the zinc level detected in these soil samples from Igbesa to Lusada road exceeded this permissible range.

Chromium (Cr)

The highest Cr concentration in the roadside soil was 2.96 mg/kg and was detected at P7 during dry season, while the wet season shows the value of 11.3 mg/kg at P3.

The concentrations of Cr determined in this study exceed the permissible range of 1.30mg/kg reported by WHO.

From the result of this study, it was deduced that the concentration of heavy metals and essential minerals at some sampling site varies from both sides. Furtherance to this, the result shows that the mean values of heavy metals are higher than the standard permissible limit of WHO except for Nickel (Ni), which is as a result of different anthropogenic activities of human such as; oil spillage, industrial waste, road construction, mechanic workshop, vehicle exhaust, traffics, fuel combustion and corrosion of batteries happening on that road. However the soil still contains good quantity of essential minerals required for plant growth. This study complies with other work reported by Zorrodu, *et al.,* (2011)and it happens to be the first research carried out on this road to assess these parameters (Pb, Cd, Ni, Cr,Zn, Co, N, P, K).

The result revealed the contamination of soil by anthropogenic human activities had large effect of heavy metals; Pb, Cd, Ni, Zn, Cr, in the studied road side soil sample. However, the essential minerals N, P, K, showed the reason for healthy growth found around these locations. These understudied heavy metalsare capable of polluting the environment, causing health risk to human, animal and altering the growth of plant.

The soil contaminated by this effluent will produce unhealthy food with heavy metals in the food chain and when consumed by human will accumulate in the body and cause risk to human health.

In view of the above there is need for the following:

Proper sensitization must be given to people plying the road to ensure that their safety is guaranteed; since the road is not tarred and disperse particles during vehicular or motor cycle movement.

Industries should be sited away from human settlements due to the pollution caused by their wastes.

Anthropogenic activities such as oil spill, discharge of battery contents, dropping of mechanic workshop waste along the road side should be reduced.

References

[1]. Abbas, T. M., Ahmad, A. A., Ismail, N. P. and Essa, A. M. (2008).Multivariate analysis of heavy metals concentration in environment.Monitoring and assessment. 143, 179-186.1

[2]. Bai, J., Cui, B., Wang, Q., Gao, H., and Ding, Q., (2010). Assessment of heavy metal contamination of road side soils in Southwest China. Stoch.Environ.Res.Risk Ass. 2010, DOJ 10.1007/s00477-008-0219-5.

[3]. Brown, P. H., Welch, R. M. and Cary, E. E. (2014).A macronutrients essential for higher plants. Plant physiology 85, 801-803.

[4]. Gray, C. W., Mclaren, R. G. and Roberts, A. C. (2013).Chemical association of Lead, Cadmium, Copper, and Zinc in street. Dusts and Roadside Soils.Environ.Sci.Technol., 15,2013,1378-1383.

[5]. Li, F. R., Kang, L. F., Gao, X. Q., Hua, W., Yang, F. W. and Hei, W. L., (2017). Traffic Related Essential minerals accumulation in soils and plants in northwest China. Soil and Sediment Contamination, 16, pp 473-484.

[6]. Nath, T. N. (2013). Heavy metals contamination of tea estates soil in Sivasagar and Dibrugarh districts of Assam, India.International Journal of Advancements in Research and Technology, 2, pp 2278-7763.

[7]. Omojola, M. O., (2011). Modification of urea with maize cob waste for use as slow release nitrogen fertilizer. Dissertation, Ahmadu Bello University Nigeria pp 111-116.

[8]. Skoog, D. A., West, D. M. and Hollen, F. J. (2008).Assessment of heavy metal contamination of road side soils.Fundamentals of Analytical Chemistry.Saunders College Publishing London.872 (G-9).

[9]. Viuf, A. (2009). A working group on the revision of maximum authorized levels of trace elements as additives in feeding stuffs. Doc. V1/71 54/99

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