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Assessment of Monthly Variation of Some Physicochemical Properties of Gosa and Kuje Dumpsites in Abuja, Nigeria

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Abstract: ***The indiscriminate dumping of hospital ,industrial and some toxic waste in open dumpsites without proper disposal technique alters the physico chemical properties of the soil. Baseline information on the contaminant effects on soil from open dumpsites will go a long way to effectively pave the need for engineered landfills in the FCT. To evaluate some physiochemical properties of the dumpsites soil,one way analysis of variance (ANOVA) test was used to compare the averages of the physico chemical parameters for significant differences. Results revealed that temperature varied significantly ($p < 0.0005$) from one depth to another; other physicochemical parameters however had no readily discernable pattern of change with respect to depth and varied insignificantly from one depth to the other.it was observed Soils at the disposal sites showed high pH, TDS and EC regime in comparison to control sites. Soil samples collected from the dumpsite showed variation in physico-chemical parameters with pH (7.7-8.5),EC(311-507), Temp.(25.9-30.4)^{0}C and TDS(153-252)mg/L and pH(7.2-8.4),EC(135-681),(Temp.(24.3-28.9)^{0}C and TDS(88-370)mg/L respectively.***

Keywords: Waste, Dumpsite, Physico-chemical parameters, soil

1. Introduction

Discharging of untreated municipal solid wastes (MSWs) onto land is very widespread in developing countries[1].Dumping of municipal solid waste alters the physico-chemical properties of the soil [2]. Open and unscientific dumping of municipal solid waste is one of the most common methods adopted since years in almost all the cities. Municipal solid waste generally constitutes of both the degradable and non-degradable substances which find their way into the under groundwater resources and soil strata. Though all natural resources have their own importance in the environment, soil has a major role to play[3]. Million tons of solid wastes from different sourceslike industrial, agricultural, commercial, residential, etc; pave their way onto the soil interfering with the natural activity of the soil. Solid waste pollutants serve as an external force affecting the physico-chemical characteristics of soil ultimately contributing towards the poor production of vegetation [4].

The amount of acidity or alkalinity is considered an important variable that affects **all** soil properties-chemical, physical and biological while some organisms are unaffected by a rather broad range of pH values, many will exhibit substantial intolerance to even negligible variations in pH.

Systematic depletion of public health and general living conditions of a given populace is largely traceable to the adaptation of man to his less than wholesome environment. Man, as an active member of his ecosystem, defined by where he lives, sources of his food, including water and even the air he breathes, is constantly exposed to the hazards of wrong applications, utilization and consumption pattern [5]

Wastes on dumpsite generally contain toxic metals, which are of concern and pose dangers to people in contact with the contaminated soils and plants. The chemical compositions of the solid waste materials often lead to changes in soil physical and chemical characteristics due to contaminations. One of the most serious contaminant groups is the heavy metals [6].

2. Materials and Methods

2.1 Study Area

The Federal Capital Territory has a land area of 8,000 KM2It falls within latitude 7° 25' N and 9° 20° North of the Equator and longitude 5° 45' and 7° 39 ' It shares boundary with Kaduna State, Niger State,Nasarawa State and Kogi State. Soil samples were collected at a depth of 0 to 15, 15-30 and 30-45 cm at 10 sampling points at each site with the aid of a soil auger into clean air-tight tubes to prevent any further changes in moisture and volatile matter. Temperature of the soil was taken instantly with a mercury-in-glass thermometer (temp at site)and Soil samples were brought to the laboratory and prepared by :20grms of soil with 50mls of distilled water, stir and analyzed for pH, Electrical conductivity(EC) ,total dissolved solids(TDS) and temperature using a Hannah pH instrument, model HI 9812

3. Results

Table 1: Physicochemical Parameters AtGosa Dumpsite

Depth (cm)	Parameter	Jan.	Mar.	May	Jul.	Sept.	Nov.	P-value
0 - 15	Temp(°C)	28.3±0.14*	29.0±0.27*	27.7±0.10	27.6±0.13	26.9±0.13†	27.5±0.09	<.0005
	EC	738±164*	1036±135*	153±08	147±14	141±05	166±12	<.0005
	pH	8.4±0.07	7.5±0.17†	9.1±0.16*	7.9±0.14	8.4±0.06	8.1±0.11	<.0005
	TDS (mg/L)	367±81	974±453*	76±04	64±05	71±03	85±07	<.0005
15 –30	Temp(°C)	27.2±0.14	27.7±0.15*	26.7±0.11	27.1±0.13	26.7±0.20	27.2±0.08	<.0005
	EC	641±81*	891±108*	126±05	128±11	140±05	153±12	<.0005
	pH	7.2±0.09†	7.4±0.14†	8.7±0.23	8.0±0.04	8.5±0.05	8.4±0.09	<.0005
	TDS (mg/L)	287±35*	456±66*	63±02	64±05	71±03	80±05	<.0005
30 - 45	Temp(°C)	26.5±0.05	26.8±0.13	26.6±0.11	26.9±0.10	26.6±0.20	27.0±0.11	0.68
	EC	679±86*	840±66*	154±20	134±05	124±05	128±10	<.0005
	pH	7.0±0.07†	8.0±0.09	8.6±0.12	7.7±0.11	8.5±0.05	7.9±0.12	<.0005
	TDS (mg/L)	339±43	421±33	72±06	66±03	67±05		<.0005

Values presented as Mean± Standard Error of Mean
Key: * = significantly higher at 95% C.L.; † = significantly lower at 95% C.L.

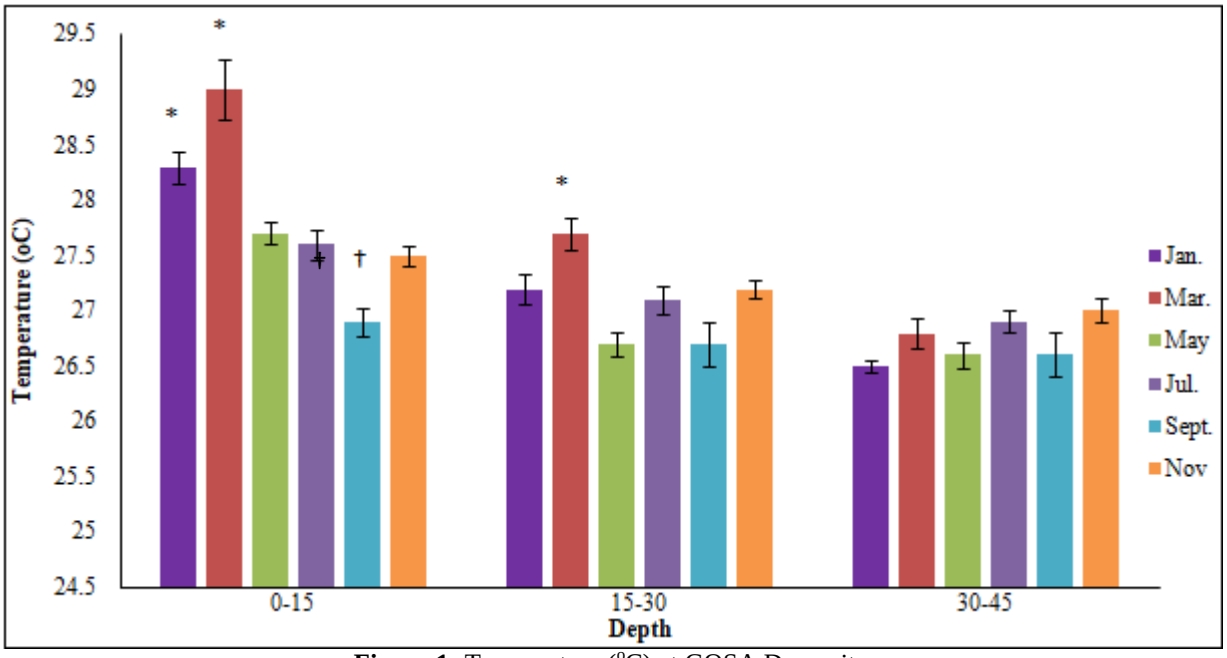

Figure 1: Temperature (°C) at GOSA Dumpsite

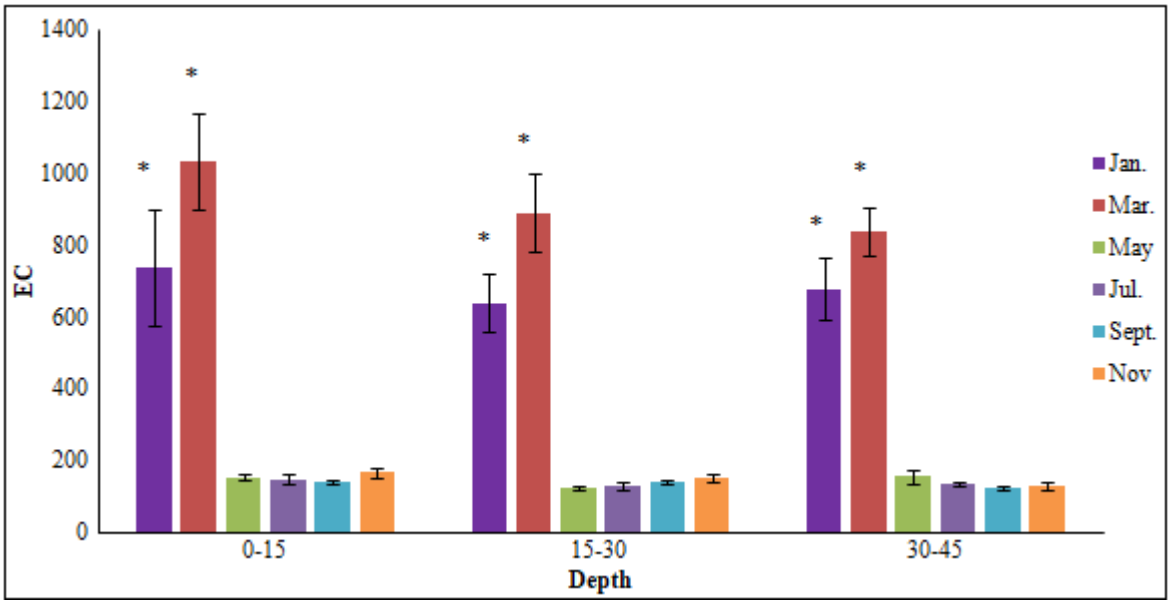

Figure 2: EC at Gosa Dumpsite

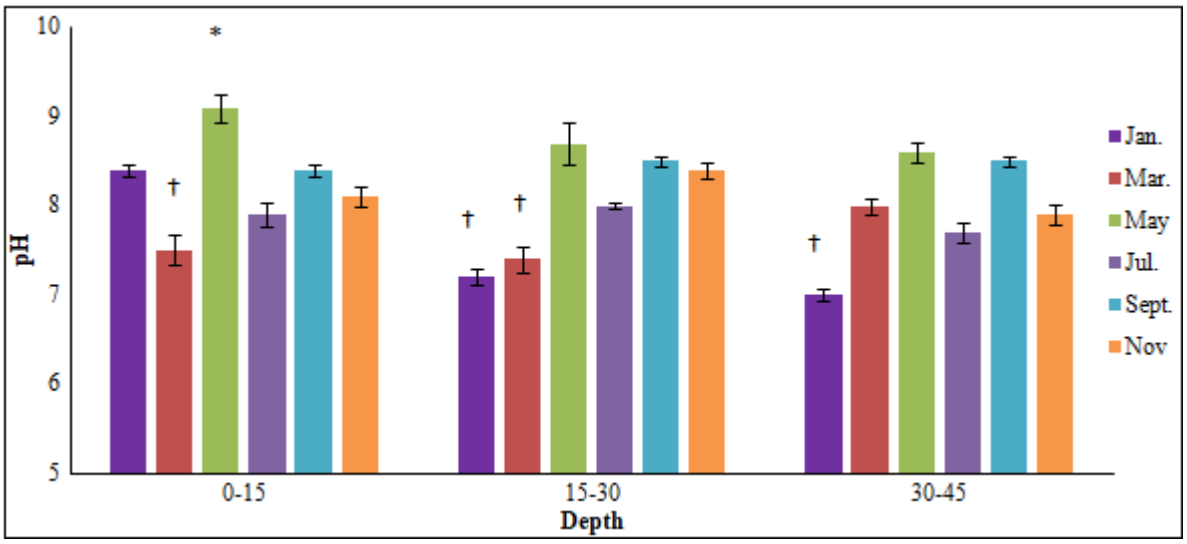

Figure 3: pH at GOSA Dumpsite

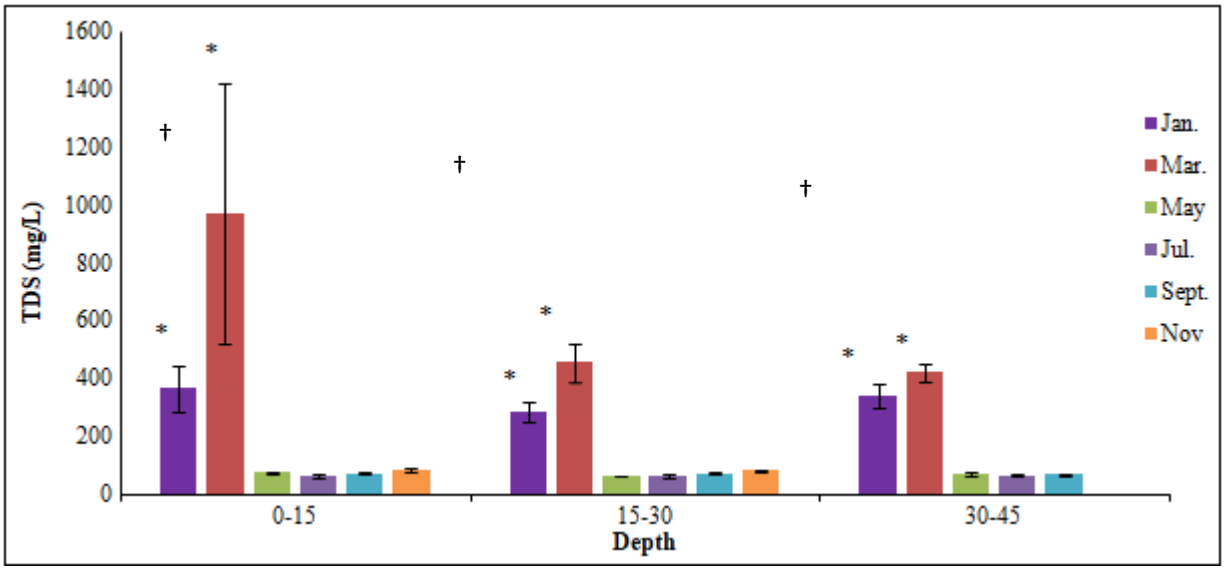

Figure 4: TDS (mg/L) at Gosa Dumpsite

Table 2: Physicochemical Parameters at Kuje Dumpsite

Depth (cm)	Parameter	Jan.	Mar.	May	Jul.	Sept.	Nov.	P-value
0 - 15	Temp(°C)	28.9±0.2	28.5±0.3	28.3±0.3	28.3±0.2	28.7±0.2	28.7±0.2	0.349
	EC	651±85*	175±14†	272±37†	414±97	494±90	434±102	0.002
	pH	7.5 ± 0.1	7.7 ± 0.1	7.9 ± 0.3	7.9 ± 0.3	8.2 ± 0.2	8.2 ± 0.2	0.126
	TDS (mg/L)	321±39*	88±07	138 ± 20	199±45	249±45	222±50	0.001
15 –30	Temp(°C)	24.8± 2.5	26.9±0.2	26.7±0.3	26.9±0.1	27.2±0.1	27.0±0.1	0.578
	EC	586±84	180±20†	200±36†	517±72	446±95	638±90	<.0005
	pH	7.3 ± 0.1†	7.7 ± 0.1	8.3 ± 0.2	8.4 ± 0.2	8.0 ± 0.2	8.2 ± 0.2	0.001
	TDS (mg/L)	298±42	91 ± 10†	100 ± 18†	274±39	218±48	317±44	<.0005
30 - 45	Temp(°C)	24.3±2.4	26.2±0.3	26.2±0.1	26.1±0.1	26.2±0.1	26.2±0.1	0.719
	EC	370±90	173 ± 11	212 ±34	430±85	135 ± 20	681±70*	<.0005
	pH	7.3 ± 0.1†	7.6 ± 0.2	7.5 ± 0.1	8.0 ± 0.2	8.0 ± 0.2	8.0 ± 0.2	0.023
	TDS (mg/L)	187 ±45	89 ± 6†	99 ± 18†	266±78	135 ± 20	338 ±35	<.0005

Values presented as Mean± Standard Error of Mean
Key: * = significantly higher at 95% C.L.; † = significantly lower at 95% C.L.

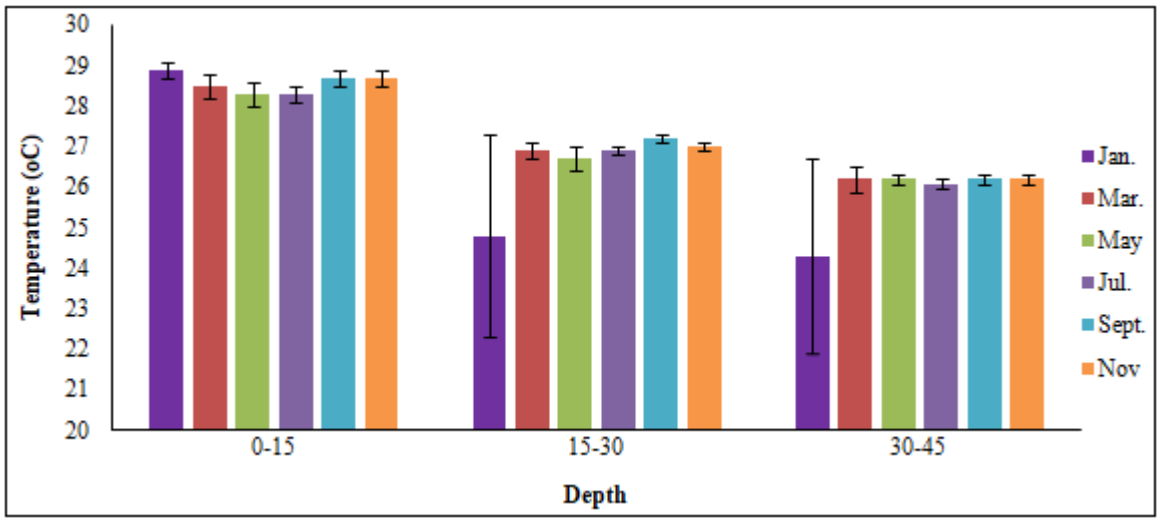

Figure 5: Temperature (^{o}C) at Kuje Dumpsite

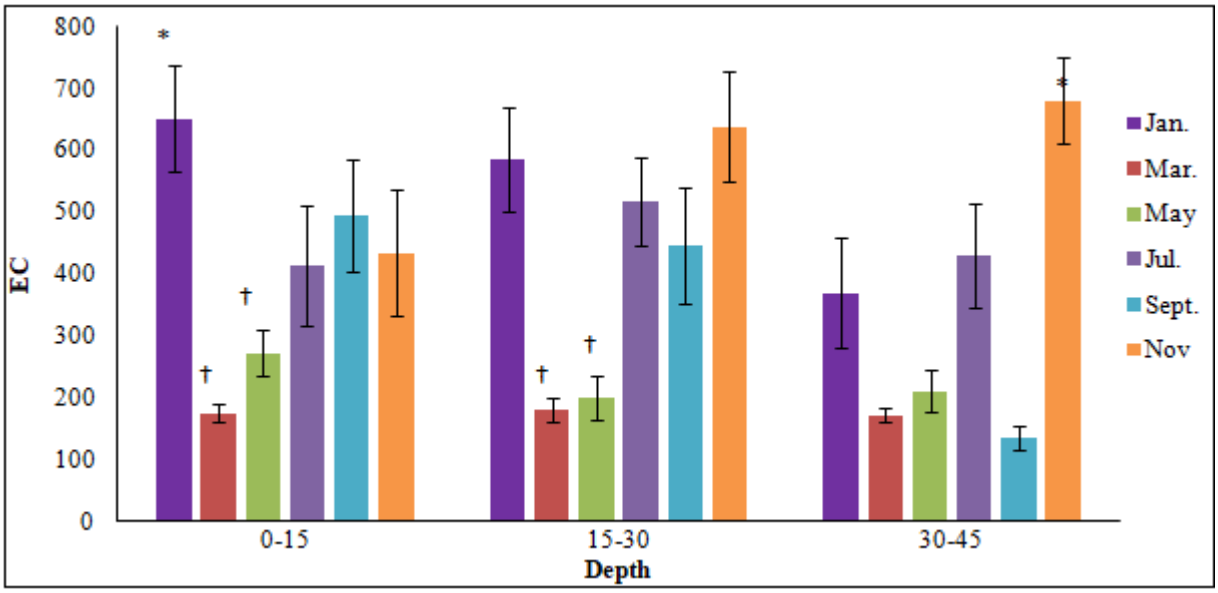

Figure 6: EC at Kuje Dumpsite

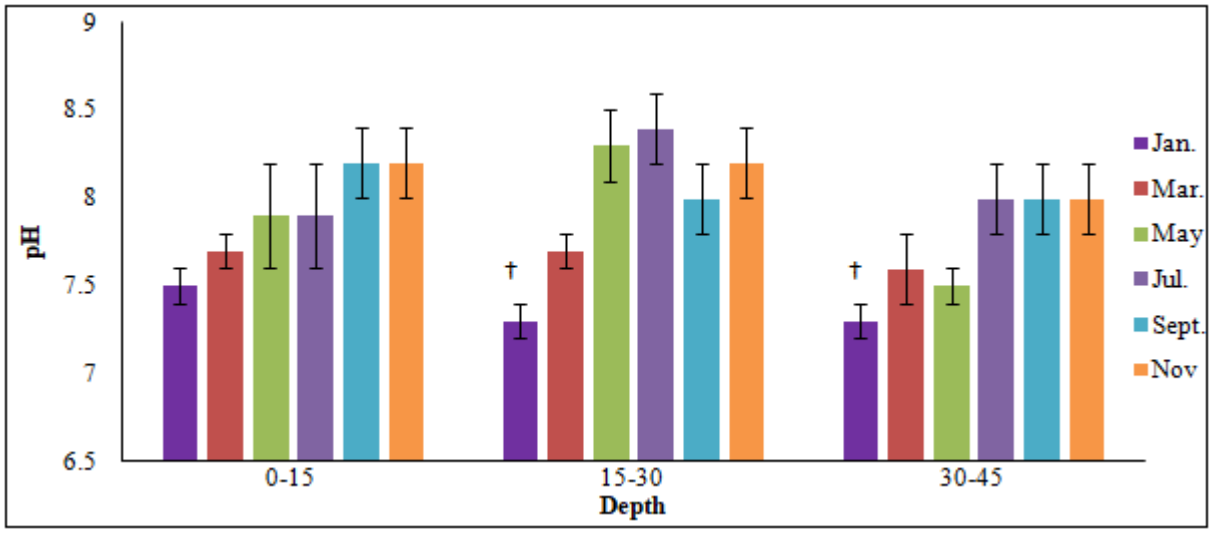

Figure 7: pH at Kuje Dumpsite

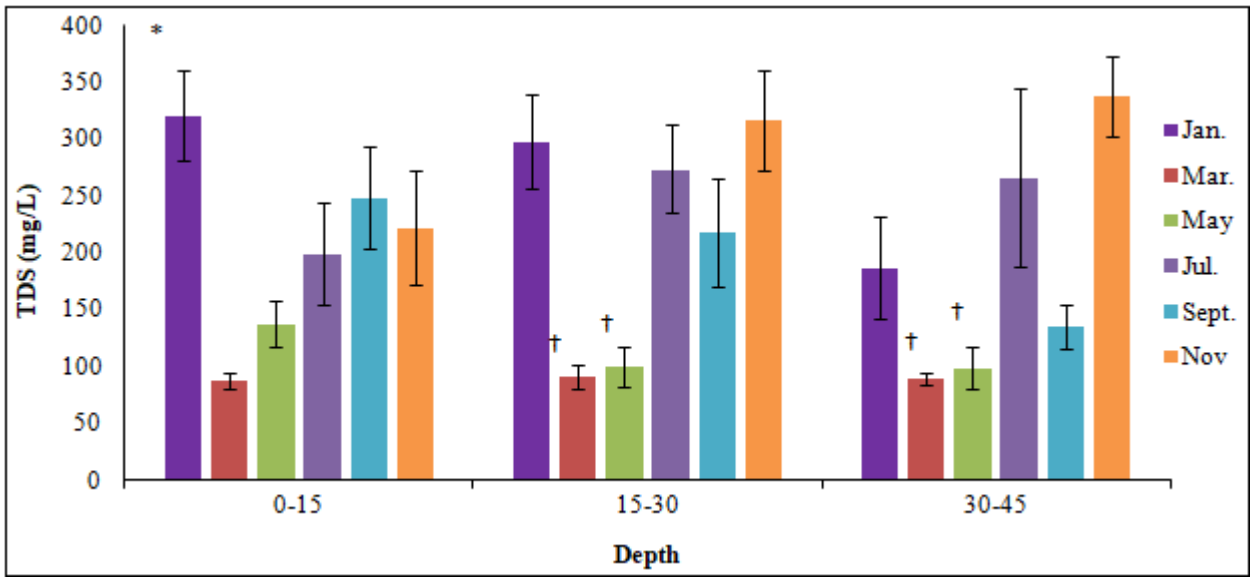

Figure 8: TDS (mg/L) at Kuje Dumpsite

4. Conclusion

Deteriorating soil quality are grave consequences of open waste dumping.Soil samples collected from the dumpsites showed variation in physico-chemical parameters with pH (7.7-8.5),EC(311-507) Temp.(25.9-30.4)^{0}C and TDS(153-252)mg/L. and pH(7.2-8.4),EC(135-681),(Temp.(24.3-28.9)^{0}C and TDS(88-370)mg/L respectively. pH is a basic measure of the chemical nature of the soil. Soils at the disposal sites showed high pH, TDS and EC regime in comparison to control sites .The high EC could be due to the increase in the salts and ions. Temperatures at the sites were found to be much higher than temperature in the laboratory and a decrease in temperature as depth increased was also noticed.

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