

Impact of Automobile Traffic and Waste Dump on Heavy Metal Concentrations in Soil of Aba Metropolis; Implication for Cassava Production

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Abstract

Analysis for heavy metals (Pb, Co, Zn, Cr, Ni, and Cu) was done on soils near road traffic and waste dump site at Aba metropolis. The result shows that the mean values (PPM) for the elements analyzed were Pb-26.11, Cd-4.07, Zn-47.18, Cr-43.9, Co-29.34, Ni-15.88 and Cu-51.48. The values were not up to the critical values though vehicular traffic and waste dumping increased the presence of Pb, Co, Zn, Cr and Ni in soil.

Keywords: Heavy metals; Vehicular traffic; Waste dump site; Soil

Introduction

Heavy metals are known to be toxic when in excess of threshold values and contribute to environmental pollution. The accumulation of heavy metals in an area may be due to farming methods, industrial effluent and emissions from vehicles antimony, phosphorus, arsenic, lead chromium, and mercury can be introduced into the environment by the use of pesticides, fertilizers and herbicides [1-5]. Some of the metals e.g. lead found on the roadside soils, vegetation and close by surfaces are discharged from automobiles [6]. The aim of this research was to assess the heavy metal pollution of the soils of Aba metropolis.

Materials and Methods

Five different soils sites were choose based on the information available on the relative traffic densities in the areas and were grouped into:

1. Site A: Soils in some villages in Aba environs (control).
2. Site B: Soil around environs with Aba environs with traffic densities above 1000 vehicles every 5 hours.
3. Site C: Soils in location with traffic densities between 250 and 1000 vehicles every 5 hours.
4. Site D: soils in locations with traffic densities lower than 250 vehicles every 5 hours.
5. Site E: Soils in areas used as solid waste disposal sites.

The soil samples were collected at depth of depth of 0-15 cm and was digested using the wet digestion method (HNO₃/HClO₄) and the filtrate analyzed for various heavy metals using atomic absorption spectrophotometer [7-10]. Analysis of variance was used to evaluate the heavy metal effect the means compared at 5% level of probability using the least significance difference.

Results and Discussions

The heavy metal concentration in soil is as shown in Table 1. The result shows that emission from vehicular traffic (sites B, C, D) and dumping of refuse (site E) polluted the soils compared with control site I. It was observed that soils in sites B, C, D and E has higher values of Cd, Zn, Co, and Ni, when compared with waste dump sites, the sites near road traffic had less value of Cr, Ni and Co. the sites with less vehicular traffic such as sites C and D have higher value of Pb, Zn and Cr than dump site [11,12]. This result shows that waste dump and vehicular traffic caused an increase in heavy metal pollution as shown

Site	Pb	Cd	Zn	Cr	Co	Ni	Cu
a	11.00 b	1.64 b	18.90 b	44.50 a	20.70 a	11.70 a	53
b	20.84 a	4.20 ab	43.20 ab	41.41 a	28.50 a	14.51 a	51.15
c	26.40 ab	3.90 ab	74.60 a	36.50 a	33.00 a	18.12 ab	52.1
d	38.21 ab	3.31 ab	55.00 ab	46.00 a	34.78 a	12.21 a	50.04
e	34.11 ab	7.32 a	44.20ab	51.51	29.73 a	22.03 ab	51.1
Toxic level	100	5	300	100	50	100	100

Table 1: Heavy metal concentration (Ng/g) of the soils at Aba, Nigeria

by the increase in concentration of Pb, Cd, Zn, Co and Ni. Although the values accorded for these elements were below the critical levels (WHO standard). Values with same superscript are not significantly different as shown by Duncan multiple range tests [13].

Conclusion

Generally, the concentrations of the heavy metals analyzed were not above the critical levels for soils though the concentration of Cd in soil from dump site (site E) was a little above the critical level which may affect production of crops like cassava planted around the dump site negatively. From the findings of this research, it is important for the concentrations of toxic heavy metals such as Pb, Zn, and Cd in soils near roads and dump site to be monitored consistently so as to detect their toxicity enough.

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