

Heavy metal concentration levels in soil at Lake Geriyo irrigation site, Yola, Adamawa state, North Eastern Nigeria

Hong, Aliyu Haliru¹, Law, Puong Ling², Selaman, Onni Suhaiza²

¹Department of Agricultural and Environmental Engineering, Faculty of Engineering, Modibbo Adama University of Technology, Yola, Nigeria

²Department of Civil Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, Malaysia

Email address:

haliruali@yahoo.com (H. A. Haliru)

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Abstract: The study assessed the physicochemical parameters and mean concentration levels of heavy metals in soil at two selected wastewater receiving sites and control site of Lake Geriyo irrigation project in order to determine the extent of heavy metal pollution due to wastewater irrigation using standard methods. The pH values at the River Benue, Shinko and control site soils were slightly acidic to neutral with mean value of 6.85, 5.75 and 7.0 respectively. Mean electrical conductivity values were 1.08 μ S/cm, 1.54 μ S/cm and 1.95 μ S/cm and organic matter levels are 0.75%, 2.11% and 3.5%. The textural classification of the soils revealed that the soils are predominantly sandy in nature with 56.4%, 55.6% and 50.4% sand, 20%, 16.0% and 19% are clay, while 24.0%, 28.4% and 30.0% are silt. The mean concentrations of heavy metals (Fe, Zn, Mn, Cu, Cd, Cr, Pb and Ni) recorded in River Benue site soil are 86.89mg/kg, 74.38mg/kg, 12.76mg/kg, 15.08mg/kg, 9.83mg/kg, 11.0mg/kg, 7.17mg/kg and 18.73mg/kg. Shinko site recorded concentration levels of 292.7mg/kg, 309.2mg/kg, 130.9mg/kg, 253.8mg/kg, 199.2mg/kg, 158.7mg/kg and 74.43mg/kg respectively, while the control site soil had concentration levels of Fe 58.48mg/kg, Zn 39.44mg/kg, Mn 7.13mg/kg, Cu 9.40mg/kg, Cd 7.62mg/kg, Cr 9.82mg/kg, Pb 6.28mg/kg and Ni 17.62mg/kg. The result showed that the concentrations of heavy metals at River Benue and Shinko site soils are more polluted than the control site soil with Shinko site soil exhibiting high levels of heavy metals concentration. Comparative analysis of this study and International threshold values of heavy metals concentration levels in soil revealed that most of the parameters at Shinko site soil are elevated above the EU, USA and UK Standards. Future study is hereby recommended to focus on the impact of heavy metal concentration on irrigated vegetables as some may find their way into the food chain and cause public health hazards to consumers.

Keyword: Wastewater, Heavy Metal, Pollution, Physicochemical, Irrigation

1. Introduction

Soil can be defined as that unconsolidated minerals and organic material found on the immediate earth surface that serves as a natural medium for plants growth and other developmental activities (Brady and Weil, 2008). Soil also act as a key component of the natural ecosystems and environmental sustainability largely depends on a sustainable soil ecosystem and any alteration as a result of either pollution or contamination ultimately alters the ecosystems and agricultural activities are also greatly affected (Hankard et al, 2004, and Ayeni et al, 2010).

Due to rapid increase in human population, industrialization, urbanization over the years, human life

styles and activities have tremendously affected the environment greatly. One of the most significant impacts is heavy metal pollution of farmland as it serves as an intimate linkage to human food chain (Niu et al, 2013). The accumulation of metals in agricultural farmland does not only decrease the productivity and quality of crops grown, but it also greatly threatens the safety of ecosystem and human health through adverse effect.

Handling and disposal of liquid waste containing heavy metals is one of the major challenge and threat to environmental wholesomeness in Nigeria where the average household waste generation is put at 0.55 – 0.58kg per capita (SWAR, 2004). The manufacture and distribution of products such as soap, cream, batteries, perfumes,