

Recycling of Organic Wastes Through Composting for Land Applications: A Nigerian Experience

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Abstract

In-vessel composting, a contribution to sustainable solid waste management, was conducted on source-separated waste materials generated in Abeokuta city, south-west Nigeria. Feedstock (household, agricultural and municipal waste) and the resultant composts were chemically characterized using standard procedures. Identification and changes in the microbial population during composting, the effects of composting on waste volume reduction (WVR) and elemental composition of composts were evaluated. Product performance on plant growth and metal uptake were then assessed using African spinach (*Amaranthus hybridus*) in a screen house for 8 weeks. Metals were determined in acid digest using atomic absorption spectrometry. Compost yields and WVR ranged from 35.28 to 48.68% and 51.66 to 64.72%, respectively. Compost heavy metal (Cu, Cr, Zn, Ni, Cd and Pb) concentrations (mg kg^{-1}), ranging from 0.67—0.82; 0.13—7.5; 0.001—0.22; 1.67—18.33; 6.50—17.67; and 0.83—6.00 for Cu, Pb, Cd, Ni, Cr and Zn, respectively, were within limits for class A+ composts. The effect of composting varied with element type and significantly ($p < 0.05$) reduced microbial population by 44.44 to 88.46%. Plant height, leaf number and biomass yield gave positive correlations ($r = 0.950$ to 0.977 ; 0.978 to 0.989 and 0.99 , respectively; $p < 0.05$) with applied compost rate. Low-metal composts were produced but the presence of Cd and Pb in plant tissues calls for further research on the long-term effect of products on plant metal uptake in amended soils. The study is a contribution to the data bank of composting as a low technology waste management option in the developing countries.
