

EVALUATION OF HEAVY METAL SPECIES IN MUNICIPAL WASTE COMPOST AND THEIR UPTAKE IN MAIZE PLANT (*Zea mays L*)

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2009

ABSTRACT

The concern of the general public and environmental scientists on the effect of heavy metal in the use of Municipal Waste Compost in crop production necessitated this study. The aim was to investigate heavy metal species in compost and its derivatives and their effect on soil and maize crop uptake following first and second cropping. The total heavy metal content (Cu, Zn, Fe, Pb, and Cd) and their species concentrations in soil, compost and its derivatives were determined using Atomic Absorption Spectrometer following wet acid digestion using ($\text{HNO}_3:\text{HClO}_4$), and the Rudd's method of sequential extraction, respectively. A green house pot experiment was conducted at the University of Ghana Agricultural Research Farm, Legon with maize grown on sandy loam soil. At maturity, maize seeds were harvested and dried together with the plants. The heavy metal content of the dried samples and or the species concentration of soil following after first and second cropping were analyzed using the above mentioned methods. The total heavy metal (Cu, Zn, Fe, Pb, and Cd) content of the compost and its derivative were all within the recommended limits. Compost and its derivative contain highest species of Cu, Zn, Fe, Pb, and Cd in the originally bound fraction whiles iron was dominant in the sulphide bound fraction. There was a build up in the total heavy metal content of the soil after first and second cropping, however, this was far below the allowable limits. Lead build up in the treated soil ranged between 48.54mg kg^{-1} and 78.71 mg kg^{-1} as compared to the allowable Pb limit (300 mg kg^{-1}). The heavy metal uptake by maize plant from soil varied depending on the composition of compost. Uptake was dependent on available species in the treatments and pH. The uptake into the maize biomass from enriched compost or enriched co-compost treated soils was higher than the uptake from compost or co-compost treated soils. The heavy metal uptake increased in maize crop following first and second cropping. However, this was within the accepted recommended limits for agricultural crops. Based on the above results it was concluded that the use of well sorted municipal waste compost and its derivative for crop production is safe for human consumption.

SUPERVISORS

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