# HEAVY METALS AND PATHOGEN LOAD IN VEGETABLES GROWN ON SLUDGE-AMENDED SOIL: THE ROLE OF SOIL TYPE

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Sewage sludge has been, and is still being used to improve agricultural yields in many countries around the world. However, the popularity of sludge as soil amendment has been affected by concerns related to possible uptake of heavy metals and pathogens from sludge-amended soils. As a result, guidelines for maximum concentration of heavy metals, and load fecal coliforms in sludge destined for agricultural use exist in many countries. These guidelines consider sludge heavy metals and pathogen load only but studies have indicated that several factors interplay to determine the bioavailability of heavy metals in sludge-amended soils and their uptake by crops. Similarly the microbiological risk of growing vegetables on sludge–amended soils depends on several a factor among which is the ability of the soil to sustain the pathogen. Both bioavailability of heavy metals and survival of pathogens in sludge-amended soils are influenced by soil physical, chemical and mineralogical properties which vary with soil orders. Soil type may play a significant role in the bioavailability of heavy metals to plants grown on sludge-amended soils, as well as the load of Escherichia coli (a fecal coliform) in plants grown. This study investigated the role of soil type in the bioavailability of heavy metals (cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc) in four soil orders amended with sludge, and their uptake by spinach and carrots grown on these soils. It also aimed at identifying the soil order that presented the highest health risk with regards to the presence of E coli in the vegetables grown. Sludge of different ages (three months and three years) were applied to four different soil types at volume/volume percent ratio of 5:95, 10:90,
20:80 and 40:60 sludge:soil. Spinach and carrots were grown for nine and thirteen weeks respectively, after which they were harvested and the concentrations of the heavy metals and load of fecal coliforms and E. coli in the vegetables determined. Results indicated significant differences in uptake of heavy metals by both vegetables from the different soils. Survival of fecal coliforms in the soils also varied with soil and sludge application rates. The role of soil type in the bioavailability of heavy metals and presence of E coli in the vegetables is discussed. Results emphasize the need to consider soil types in the design of guidelines for sewage sludge use in agriculture.

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