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Characterization of Compost and Screening of Antibiotic Residues, Antibiotic Resistant Bacteria in Commercially Available Compost in Sri Lanka

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Abstract

Antibiotics are chemical substances that kill or inhibit the growth of bacteria by interfering with metabolic processes. The resistance among various bacterial species to different antibiotics has emerged as a cause of public health threat all over the world at a terrifying rate. Antibiotic residues and antibiotic-resistant bacteria can enter the environment in many ways, and compost is one such way. Composting of municipal solid waste is widely used as a greener approach and a low-cost method of global waste management. However, antibiotic residuals in the MSW compost cause a critical impact on human health by developing antibiotic resistance in environmental bacteria. Therefore, the focus of the present study was to evaluate the antibiotic resistance and antibiotic residuals in selected compost types to determine the quality of the compost. Five different composts that are commercially available in Sri Lanka were investigated for the presence of antibiotic residues and resistant bacteria. Solid-Phase Extraction (SPE) was employed to concentrate antibiotics and quantification was done by High Performance Liquid Chromatography (HPLC). Recoveries for each antibiotic was remained between 83%±0.021 to 95%±0.034. The Total Viable Counts (TVC) were measured using the standard pour plate method using Lauryl-Bertani (LB) medium. To enumerate antibiotic resistant bacteria, filter sterilized (0.2 µm) antibiotics; Amoxicillin and Ciprofloxacin at final concentration of 60 µg/mL were spiked to each molting agar media (40^o C) before preparing plates and continued standard pour plate method. In the present study, none of the amoxicillin and ciprofloxacin groups targeted were detected in any compost sample. Amoxicillin resistance ranged from 1% to 90%, and ciprofloxacin resistance ranged from 6% to 44%. Overall, amoxicillin-resistant bacteria were higher than ciprofloxacin. The results of the study revealed that release of antibiotics into the environment will lead to an emerge in antibiotic resistant bacteria and it compromises the effectiveness of antibacterial therapy, since the infectious organisms become resistant against more antibiotics.

Keywords: Amoxicillin, Ciprofloxacin, Resistance, Solid-phase extraction, High-performance Liquid Chromatography