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Isolation of Antibiotic-Resistant Bacteria, Multiple Antibiotic Resistance Index, and Antibiotic Resistance Genes in Compost from the Western Province of Sri Lanka

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Abstract

The dispersion of antibiotics in the environment has played a role in spreading Antibiotic Resistance Genes (ARGs) that cause resistance. Contaminated compost with antibiotic-resistant bacteria (ARB) and ARG can infiltrate into water resources or spread through the soil, it may bring ARB which can exchange genes with the other environmental bacteria. This can contribute to the development of antibiotic-resistant pathogen populations in the environment. The objectives of the present study were the isolation of Amoxicillin (AMX), Cloxacillin (CLOX), Tetracycline (TET), and Ciprofloxacin (CIP) resistant bacteria from six municipal solid waste samples and five commercially available compost samples, the determination of multiple antibiotic-resistant indexes (MARI), and the detection of ARGs in resistant bacteria. ARBs were isolated according to the Clinical & Laboratory Standard Institute (CLSI) guidelines. Among 68 isolates, 37% exhibited resistance to AMX, 35% to CLOX, 15% to TET, and 13% to CIP. The Multiple Antibiotic Resistant Index (MARI) range varied from 0.25 to 1 for the isolated bacteria against tested antibiotics. The highest number of bacteria (45.5%) showed a MAR index 0.25. The ARGs, *amp* a, *bla* TEM, *bla* OXA, *OPR* (D), *tet* (A), *tet* (M), *gyr* A, and *gyr* B were selected for the screening of ARB and the amplification was done using PCR protocol. From the selected genes, *bla* TEM was detected in a high percentage (40.5%) in AMX-resistant bacteria, *OPR* (D) was detected in a high percentage (40.5%) in CLOX-resistant isolates, *gyr* B gene (54%) was detected at a higher percentage whereas tet (M) was detected in a high percentage (56%) in TET bacterial isolates compared to other resistant genes. However, all the collected samples were positive for at least one resistance gene. It is important to prevent antibiotic resistance from entering the environment through compost, as it poses considerable threats to public health. These findings can be used to provide a baseline for future research on controlling antibiotic resistance in agricultural operations.

Keywords: *Antibiotic-resistant bacteria, Antibiotic-resistant genes, Compost, Multiple antibiotic-resistant index*