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Effects of anaerobic composting on tetracycline degradation in swine manure☆

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Abstract:

Oxytetracycline (OTC) and tetracycline (TC) are the most common TC antibiotics used in human and veterinary medicine. Residual amounts of these antibiotics in manure pose a potential threat to public and ecological health as a result of the potential for them to be released to the environment following land application of manure from animals treated with antibiotics. We investigated the degradation of OTC and TC during anaerobic composting. We tested the effects of temperature and antibiotic concentration on degradation rates in a control and in manure spiked with TCs. We examined changes in pH, biological degradation material (BDM), and moisture corresponding with antibiotic degradation of TCs in the swine manure. Results showed that the OTC and TC concentrations decreased by between 68.54% and 95.50% in all nine treatments following 14 days of anaerobic composting, and the highest removal efficiencies were observed at an incubation temperature of 55°C and initial concentrations of 10.36 μg·g^{-1}, and 5.96 μg·g^{-1} of OTC and TC, respectively, which were degraded by 95.50%, and 90.06%. During composting at 55°C and at added concentrations of 5 μg·g^{-1}, OTC decreased rapidly, and the time required for 50% and 90% degradation were 4.1 and 9.8 days, respectively; for TC, these values were 4.4 and 14.0 days, respectively. Removal efficiencies for all TCs correlated well with moisture content of the manure. These results show that composting may be a practical and useful mean to reduce concentrations of OTC and TC in swine manure prior to its land application.

Keywords:

Antibiotics; Tetracyclines; Anaerobic composting; Swine manure

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1. Introduction