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ORIGINAL PAPER

Reducing the transfer kinetics and holdup enhancement of antibiotics in soil by modifying its composition using montmorillonite

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Abstract

Five different soil compositions were prepared, each with varying montmorillonite (Mt) content of 2%, 5%, 10%, 15%, and 20% in a simulated column and irrigated with TC contaminated solution. The transfer kinetics of TC in different soil compositions were found to be primarily influenced by the Mt content. Increasing the Mt percentage resulted in a reduction in transfer kinetics. Furthermore, as the percentage of Mt increased, so did the amount of absorption and the holdup capacity of the soil. Conversely, when it came to release kinetics, an increase in Mt content significantly reduced the amount of TC released from the contaminated soil. In an optimal scenario with 15% Mt content, approximately 10% of absorbed TC was desorbed into the environment while 90% remained absorbed within the soil structure. In contrast, in samples with 0% Mt present, 95% of absorbed IC was desorbed and less than 5% remained. The adsorption process primarily occurred within the interlayer spaces of Mt, indicating strong adsorption capabilities for TC within the soil and a reduced likelihood for release. The FTIR results corroborated the previous findings by demonstrating the emergence or alteration of distinct peaks associated with the bonds of TC functional groups following adsorption and desorption on the examined soil. Consequently, these findings have potential applications across various scientific disciplines, enabling the mitigation of antibiotic transfer kinetics and enhancing soil's capacity to retain antibiotics, thereby addressing the issue of antibiotic-contaminated water bodies.

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