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Effects of Growing and Decaying Corn Plant Roots on *Escherichia Coli* Transport in Soil under Saturated Condition

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Abstract

Macrospore created by decaying plant root provides pathways for rapid transport of pollutants in soil profile. The main objective of this study was quantitative analysis of the effect of plant root (*Zea mays* L.) on bacterial and chloride transport through soil. Experiments were conducted in 9 soil columns packed uniformly with loamy sand. The treatments were bare soil, bare soil with corn (*Zea mays* L.) root and bare soil after decaying the corn root. The Breakthrough curves of Chloride were measured. Breakthrough curve (BTCs) of *Escherichia coli* and chloride were measured, too. The HYDRUS-1D one and two site kinetic attachment–detachment models were used to fit and forecast transport and retention of bacteria in soil columns experiment. The results indicated that the difference between soil hydraulic properties (saturated hydraulic conductivity and flow velocity) of the treatment was significant ($p < 0.05$). The result also showed that the two-site kinetic model leads to better prediction of breakthrough curves and bacteria retention in the soil in comparison with one-site kinetic model. Interaction with kinetic site 1 was characterized by relatively fast attachment and slow detachment, whereas attachment to and detachment from kinetic site 2 was fast. Most of the cells showed retention close to the soil column inlet, and the rate of deposition decreased with depth. Low reduction rate of bacteria of the soil columns with plant root and with void root channel indicated the presence of macrospores in the soil created by deep corn root system.

Keywords: Bacteria transport, Plant Root, *Escherichia coli*, Saturated flow, Breakthrough Curves.

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