

Comparison between Experimental Modeling and HYDRUS-2D for Nitrate Transport through a Saturated Soil Column

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Abstract : Recently, the pollution of groundwater from the use of nitrogenous fertilizer is at the increase. Also, due to the increase in area under cultivation and regular use of fertilizer in irrigated agriculture, groundwater pollution from agricultural activities is becoming a major concern. Because of the high mobility of Nitrate (NO_3^-) in soil which is governed by electrostatic processes, particularly anion exclusion, nitrate can be intercepted by shallow subsurface drainage pipe systems and then discharged offsite into streams, rivers, and lakes causing many hazards. In order to solve these environmental problems associated with nitrate, a better understanding of how NO_3^- moves through the soil profile under flow conditions is required. In the present paper, the results of a comparative study between experimental and numerical modeling of Nitrate transport through a saturated soil column are presented and analyzed. In order to achieve that, three water fluxes densities; 0.008, 0.007, and 0.006 m sec⁻¹ and N concentration rates 10 mol cm⁻³ were used. The same concentrations were used in the simulation using HYDRUS-2D. The physical and chemical properties of the collected soil samples were calculated. Besides, the soil texture was determined which was silty sand. Results showed that HYDRUS-2D can successfully predict the relative behavior of N transport in the present experiment. Nitrate concentrations will reach deeper depth with the increase in the water flux. Overall, it was overestimated in the final concentration of (NO_3^-) in the soil by numerical simulation than by experimental column test. The column experiment is a useful tool for assessing the nitrate concentrations in the soil profile.

Keywords : groundwater, nitrate leaching, HYDRUS-2D, soil column

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