

Simulation of Fluoride Transport in a Calcareous Soil Using HYDRUS-1D

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Abstract

Transport of fluoride and consumption of groundwater with excess fluoride concentrations poses a health threat to millions of people around the world. The objective of this study was to simulate transport of fluoride (F) using HYDRUS-1D model. The study was conducted in lysimeters at Lavark research station site in Isfahan. The treatments consisted of two concentrations of F (157 and 315 mg kg⁻¹). The duration of the study was 125 days. Some of soil physical and chemical properties, soluble F and total F concentration were determined during the study. The results showed the transport of F in calcareous soil profiles. This may be due to the high pH and desorption of F ion as a result of repulsion by the more negatively charged soil surfaces. The highest concentration of total F and water soluble F were observed in the 10 cm surface soil layer. The concentration of F decreased with increased soil depth. The correlation coefficient was significant between the water soluble fluoride and the total fluoride (1% level). Also, the difference between the observed t- value and a critical value on the t distribution is statistically insignificant. It showed that the model simulated successfully water soluble F concentration in the soil profile.

Keywords: Fluoride, model, HYDRUS-1D, calcareous soil.

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