Analysis of 2,4-D Concentration in Silty Clay Soil Under Two Irrigation Regimes Using LEACHP and PRZM-3 Models

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Abstract

Evaluation of pollutant transportation in soil is important from different environmental aspects such as soil and groundwater contamination. The purpose of this study is to measure 2, 4-D concentrations in a silty loam soil under two different treatments (normal and deficit irrigation) in a corn field and simulate the results using the PRZM-3 and LEACHP models. Total concentrations of 2, 4-D in the soil profile in 8, 13, 23, 30, 37, and 57 days after application for normal irrigation were 18.5, 16.36, 11.67, 10.47, 8.47 and 3.2 mg kg^{-1}, respectively. For these dates, PRZM-3 model simulated 18.5, 16.36, 11.67, 10.47, 8.47 and 3.2 mg kg^{-1} of 2,4-D, respectively and LEACHP model simulated 23.34, 20.93, 16.7, 16.3, 12.9 and 11.41 mg kg^{-1} of 2, 4-D, respectively. Total concentrations of 2, 4-D in the mentioned dates for deficit irrigation were 20.2, 16.7, 11.22, 10.05, 8.8 and 7.3 $mgkg^{-1}$, respectively. For these dates, PRZM-3 model simulation results were 21.9, 19.89, 14.2, 10.62, 9.6 and 8.22 mg kg^{-1}, respectively and LEACHP model simulation results were 25.22, 21.3, 19.43, 18.58, 18 and 16.27 mg kg^{-1}, respectively. The simulation results showed that performance of PRZM-3 model was better than LECHM model in both treatments. In this research, the half-lives of 2, 4-D for 0-10 cm and 10-20 cm of soil depth were 7 and 33 days in a normal irrigation, and 9 and 34.65 days in a deficit irrigation, respectively.

Keywords: Simulation, Normal irrigation, Deficit irrigation.

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