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Bromide and Lithium transport through intact soil columns influenced by crop management

Golayeh Yousefi, Ali Akbar Mahboubi, Mohammad Reza Mosaddeghi, and Azadeh Safadoust
Islamic Republic Of Iran (golayeh.yousefi@gmail.com)

Cropping systems and managements can affect the water movement and solute transport through modification of soil structure. Our aim in this study was to investigate two soil textures and two crop managements combination effects on Lithium and Bromide transport under unsaturated flow conditions. The experiments were performed on 32 undisturbed soil columns (16 cm diam; 25cm deep) representing two soil series: structured clay loam and unstructured sandy loam which had been cropped with either wheat or alfalfa for 4 years. The steady state flow condition established using tap water prior to performing a pulse of 0.005 M LiBr solution on the surface of columns. Leaching monitored up to four pore volumes for each column. The Br- and Li+ concentrations as tracer were measured in the effluent using bromide selective electrode and flame photometer respectively. Breakthrough curves for leached Br- and Li+ in the soil columns exhibited an early higher concentration of both tracers indicating the preferential flow effect, in such that Br- concentration in term of magnitude was more than Li+. Both Br- and Li+ concentration decreased with time and converged at low levels suggesting that soil macropores were blocked and leached was then transported in both soils via matrix flow. Clay loam under alfalfa showed higher Br and Li concentration levels comparing with sand loam under wheat crop production. In the soil under alfalfa structural cracks, root channels and wormholes were the cause of higher leached concentration for both tracers in compression with the soil under wheat. Theses results suggest that the preferential flow were more important in the soil under alfalfa than under wheat.
Keywords: soil structure; Breakthrough curve; preferential flow; Alfalfa