Development of a soil specific function for scaling hydraulic conductivity reduction using alkaline irrigation water in HYDRUS model

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Soil structure stability and hydraulic conductivity are important soil physical properties in agriculture and hydrology. This study aimed to review and evaluate the current scaling hydraulic conductivity reduction factor in HYDRUS model. Nine Australian soils with contrasting properties were selected to determine saturated hydraulic conductivity reduction using different irrigation water with pH of 6 , 7, 8 and 9 at electrolyte concentration of 0.8, 1.5, 2.5, 5.0, 10, 25 and 5 $dS.m^{-1}$ and sodium adsorption ratio of 20 and 40. The results of hydraulic conductivity were used to develop a generalised function for scaling hydraulic conductivity similar to the current HYDRUS standard function for effects of pH on soil hydraulic dynamics. A nonlinear model was also developed with considering soil clay content and pH and electrolyte concentration of applied irrigation water. The comparison of observed hydraulic conductivity reduction and predicted results indicates that the developed models objectively well predicted the change in hydraulic dynamics due to pH of irrigation water for Australian and Californian soils. The nonlinear model performed greater prediction for individual soils compared to newly generalised model and HYDRUS standard model. Therefore, nonlinear model needs to be considered in future HYDRUS developments.