Seepage Estimation in Water Conveyance Canals by Emirical Equations and SEEP/W model

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Abstract

Increasing conveyance efficiency and reducing water loss in distribution canals are very important. The current study aimed at investigating and comparing empirical equations and SEEP/W model for estimating seepage of earth channels. For this study, the earth canal of Boldaji, constructed in loamy soil and located downstream of modern irrigation and drainage network of Gandoman and Boldaji, Chaharmahal and Bakhtiari province, was chosen. Using dimensional similitude equations and considering 0.13 as scale ratio, the dimensions and discharges of the mentioned channel were applied to the laboratory model. In this study, 9 discharges (40-161 L/s) were converted to the applicable discharges of the model. Experiments carried out for 4 different water table depths and trapezoidal and triangular cross sections with 3 replications. Furthermore, by employing modified empirical models of Moritz, Ingham, India, Molesworth and Yennidumia, Offengenden, and Davis-Wilson, besides SEEP/W model, the amounts of seepage in the lab model were estimated. The results showed that for all investigated conditions and considering R^2, r, RMSE, and MAE, Moritz presented the closest and the most accurate estimates of seepage (R^2=0.992, r=0.996, RMSE=0.48 and MAE=0.44 lit/m^2/min). Moreover, due to poor results of Molesworth and Yennidumia and Indian equations, they are not suggested for the study area.Although SEEP/W demonstrated appropriate performance for trapezoidal cross section, it did not show promising results for the triangular one. Considering the lower costs and shorter time as the results of utilizing dimensional analysis, it is recommended for controlled laboratory conditions in other similar regions.

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