

# **A Comparative Study to Assess the Suitable Models for Predicting the Infiltration Rate in an Arid Region**

Ahmed Shahadha Muneeraa , Khamis Naba Sayelba , Ammar Hatem Kamalca

## **Abstract**

Surface infiltration plays an important role in watershed management and flood forecasting; Furthermore increase the efficiency of irrigation system and reduce water losses during the irrigation process. Experiments carried out on the Wadi AL-Ratga of the western desert, Iraq during 2019; which had been selected as a study area. The infiltration rate data were collected using double ring infiltrometer at selected ten points of the selected study area. The duration of double ring test ranged between 30 minutes to one hour based on the infiltration speed in the soil, about 6 to 12 readings were recorded for the infiltration rate at each points. The aim of this paper is to check the ability of the common infiltration models such as Horton's, Kostikov's and Philip's to accurate estimated infiltration rate. These models were fitted to the observed infiltration data for estimation of models parameters and to find appropriate model for this region. Horton's infiltration model's parameters such as infiltration decay constants "k" And the value of infiltration capacity at onset of infiltration ( $f_0$ ) had been calculated in the ranges of 3.38-6.97 hr<sup>-1</sup> and 21 to 47.8 cm.hr<sup>-1</sup> ; respectively; for all the ten points. Philip's infiltration model's parameters such as the values of conductivity constant „A“ and sorptivity "S" were obtained in the ranges of 3.48-12.49 cm.hr<sup>-1</sup> and 9.96 to 17.2 cm/hr<sup>0.5</sup>; respectively. Similarly; the Kostikov's model's parameters „a“ and „b“ were obtained in the range of 8.85-24.38 and 0.732-0.829; respectively. Based on results of infiltration models at the selected points the predicated parameters have realistic capability predication. The results showed that all models provided the acceptable values for Root Mean Square Error (RMSE) as 1.45, 2.01, 1.88 cm.hr<sup>-1</sup> for Horton's, Kostikov's and Philip's model; respectively; The highest model efficiency (ME) as 99% for all models; and the maximum Relative Error (RE) values as 16% at all points except point 2 was calculated as 21%. This indicated that infiltration can be well-described by the Horton's model little more than other models at the study area.