Doi: 10.25695/AGRPH.2018.01.05

# SATURATED HYDRAULIC CONDUCTIVITY OF SOILS: EXPERIMENTAL DEFINITIONS AND CALCULATION BY MEANS OF PEDOTRANSFER FUNCTIONS

**A. I. Mady[1,2], E. V. Shein[1]**

*[1]Moscow State University, Faculty of Soil Science,*
*Department of Physics and Melioration of Soils,*
*119991, Moscow, Russia;*
*[2]Ain Shams University, Faculty of Agriculture, Soil Science Department,*
*11241, Cairo, Egypt*
*E-mail: ahmed_mady@agr.asu.edu.eg*

Soil saturated hydraulic conductivity (Ks) is playing an important role in irrigation, drainage and soil water flow. Pedotransfer Functions (PTFs) are widely used for estimating soil hydraulic properties. The aim of the study was to validate PTFs using non-linear regression (NLR) for estimation of saturated hydraulic conductivity. Moreover, selection of the best predictor variables is used for PTFs determination. The combination of different soil physical properties as PTF model's independent variables has been tested. Six classes of PTFs were proposed using NLR: Ks-1 (Clay + Silt + Sand), Ks-2 (Clay + Silt + Sand + Bulk density), Ks-3 (Clay + Silt + Sand + Organic matter), Ks-4 (Clay + Silt + Sand + Bulk density + Organic matter), Ks-5 (Clay + Bulk density + Organic matter) and Ks-6 (Clay + Sand + Bulk density + Organic matter). Soil hydraulic conductivity was measured by a constant head method and predicted by proposed PTFs based on NRL. Determination coefficient ($R^2$), Root Mean Square Error (RMSE) and Geometric mean error ratio (GMER) were used for estimating the efficiency of proposed PTFs. The best proposed class developed by NLR was Ks-2, RMSE = $2.72\times10^{-6}$ m $s^{-1}$ for silty loam and silty clay loam soil under study. Non-linear regression is more appropriate for predicting Ks than Rosetta database (RETC program). The efficiency of non-linear regression is based on the correlation coefficient between Ks and soil physical properties. Moreover, the application of developed PTFs using non-linear regression was suitable for calculating Ks.

***Keywords*:** soil hydrology, filtration, non-linear regression model, clay loam sod-podzolic soils.