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Determination of the Tangential Model Parameters for different soil types using the Unsaturated Soil Database (UNSODA).

Magatt Thiam[1*], Anzu Shigeoka[2], Hirotaka Saito[3], Yuji Kohgo[4]

[1]PhD Student, United Graduate School of Agriculture, Tokyo University of Agriculture and Technology, [2]Undergraduate Student, Tokyo University of Agriculture and Technology, [3]Department of Ecoregion Science, Tokyo University of Agriculture and Technology, [4]Professor, Graduate School of Agriculture, Tokyo University of Agriculture and Technology

The use of Tangential Model proposed by Kohgo (1995) in Soil Water Retention Curves (SWRCs) fitting requires to know some parameters related to: (i) the soil air entry value, (ii) its maximum specific moisture capacity, (iii) its critical suction and degree of saturation; and (iv) the slopes of the curve. In this study, an attempt is made to determine these parameters for different soil types. For that, the Unsaturated Soil Hydraulic Database, UNSODA, is used as a data source. Two methods were used to fit SWRCs data, from UNSODA, to Tangential Model. SWRCs data chosen in this study, from UNSODA, were those of sand, clay, silty clay, and sandy loam.

First approach is that of M. Brown (2000) which uses SOLVER, a built-in Microsoft Excel function, with Tangential Model equation as a user defined function. For this method, good accuracy was not always guaranteed and the smoothness of curves at lower and higher suction ranges remained difficult to satisfy. However it does permit a fast and approximate fitting. It was noticed that parameters obtained by this method depend highly on the initial input values (initial parameter input).

Determining the parameters graphically on the curves obtained from the experimental results was the method that gave the best fit with Tangential Model. Results showed a relative good agreement between experimental data points and fitted curve in the case of sand (same bulk density), silty clay and clay (close bulk density value); while they remained less accurate in the case of sandy loam. From the obtained results, the parameters determined for the different sands were very close. However, in the case of clays and silty clays, some differences were observed especially for the lower and higher suction ranges. The results put in perspective possible correlation between Tangential Model Parameters and/or the bulk density which is to be investigated further.

Keywords: soil water retention curves, degree of saturation, suction, fitting, UNSODA, parametric model