Abstract

Particle size distribution (PSD) curve is one of the key soil physical characteristics which has been widely used to estimate the soil hydraulic properties such as soil water retention curve, and saturated and unsaturated hydraulic conductivity. Determining the percentage of soil texture fractions (sand, silt and clay) does not provide full information about the soil PSD curve. However PSD experiments are often time-consuming and expensive. Thus various parametric PSD models have been proposed to describe a full range of the soil PSD from sparse experimental data. Over the last decades, several mathematical models based on different assumptions about the relationship between particles density and size, have been proposed to describe soil PSD curves. The aim of this study was to assess the accuracy of several PSD models for soils of Sistan dam region. 113 soil samples were collected and their PSD curves and soil texture fractions were determined using standard methods (sieving and hydrometer). Then, six PSD models were fitted to the experimental data of all soil samples. The Jacky, Simple lognormal, Gompertz, Normal, Shiozawa-Campbell and Fredlund models were used in this study. The most accurate model was determined once for the total data and then for each of texture types based on some evaluation criteria. Results showed that the Fredlund model was the most accurate model for all soil samples as well as for all soil textural classes. Due to limited textural changes in soil samples, the results were similar. Simple lognormal and Shiozawa-Campbell had the weakest fitting, which could be due to loamy and sandy loam soil texture types over this region as these models were proved to have the best results in clay soils. The performance of PSD models was increased by increasing the fitting parameters numbers, but this does not mean that a model with the more fitting parameters may have necessarily higher fitting accuracy.

Key words: Particle size distribution, Jacky model, Fredlund model, Simple Lognormal model, normal model, Gompertz model , Shiozawa and Campbell model

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Title:

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