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Soil texture fractions and fractal dimension of particle size distribution as predictors of interrill erodibility

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Abstract: Choosing a particular textural fraction as an erodibility predictor is often confusing because various fractions of soil particles have been introduced as erodibility index by many researchers. Recently, advances in fractal theory have introduced a scaling parameter for characterizing soil fragments. The objectives of this study were (i) to test the applicability of fractal dimension of particle size distribution (PSD) for estimation of interrill erodibility and (ii) to study the relationship between interrill erodibility and soil texture components. Samples from 36 soil series with contrasting characters were collected from northwest Iran. The sand fractions were obtained by sieving, while silt and clay fractions were determined by hydrometer. Fractal dimension (D_B) of PSD was estimated. A rainfall simulator with drainable tilting flume (1 × 0.5 m^2) at a slope of 9% was used and interrill erodibility (K_i) was calculated for 20, 37, and 47 mm h^{-1} rainfall intensities. The results showed a positive correlation between K_i and clay content. The degree of dependence of K_i to soil texture fractions (sand, silt, and clay contents) was greatly affected by the rainfall intensity level. Using either texture fractions (sand, silt, very fine sand and sand) or D_B did not affect the accuracy of the K_i-predicting models. As use of fractal dimension could follow the principles of uniqueness, fractal dimension of PSD may be applied as an alternative of texture fractions for prediction of interrill erodibility.

Key words: Erosion predictor, fractal dimension, interrill erodibility, soil texture

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