Structural Stability Of An Alfisol Under Various Fallow Management Practices In Southwestern Nigeria

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Abstract

The effects of legume-based soil management on soil dispersion were studied on an Alfisol between 1994 and 1995 in an experiment which was established in 1989 in southwestern Nigeria. The fallow systems, which constituted the main plots in the split-plot experiment, included natural fallow, Pueraria phaseoloides (Roxb.) Benth, and Leucaena leucocephala Lam de Wit. The subplots were 25, 33, 50 and 100 per cent cropping intensities. Apart from indices of soil dispersion such as water-dispersible clay and dispersion ratio, the fractal theory was applied to describe the fragmentation of soil aggregates less than 4 mm under the systems and cropping intensities. Although water dispersible clay was less than 60 g kg−1 in the 0–15 cm soil depth because it was inherently low in clay content, the soil dispersion ratio was generally above 50 per cent. Also, the fractal dimensions, which ranged between 2.75 and 2.89, were similar among the fallow systems with cropping intensities for the surface soil. However, the interaction of slope position with season caused significant differences in fractal parameters, suggesting that the processes of soil degradation were different for the upper and lower slopes even with similar microaggregate distribution. The soil was inherently vulnerable to soil dispersion, although, the fallow management systems with less than 100 per cent cropping intensity would maintain soil structure at similar level as the forest.

Keywords: water-dispersible clay; dispersion ratio; fractal dimension; fallow management; cropping intensity; tropics; Nigeria

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