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Soil Organic Matter Fractions in Desert Tropics as Influenced by Application of Organic Residues

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Abstract

The contribution of organic waste (crop residue and sewage sludge) to soil organic matter (SOM) in the sand size (particulate organic matter, POM) was investigated in soil samples (0–20 cm) collected from field experiments conducted from November 2008 to February 2011 at the experimental farm of Omdurman Islamic University, Sudan (15°19.9 N, 32°39′ E, and with an elevation of 381 m above the sea level). The study was conducted for five seasons (wheat–guar–wheat–guar–wheat) to study the contribution of organic residues in sustaining yields of wheat (*Triticum aestivum* var. Imam) and guar (*Cyamopsis tetragonoloba* local var.) in a crop rotation system. Treatments included recommended inorganic fertiliser (NP) with crop residues (RF+CR), crop residues (CR), 10 t ha⁻¹ sewage sludge (SS) and control (C). Each treatment was assigned to a plot of 4 m × 4 m and arranged in a randomised complete block design with four replicates. Soil organic matter size fractionation was carried out in samples collected after the harvest of the fifth crop (2011). Results showed that, dry matter content of POM in (RF+CR) and (SS) treatments were significantly ($p \leq 0.0001$) higher than the control (C) and crop residue (CR) treatments. Similarly, the N content was also significantly ($p \leq 0.0001$) affected by RF+CR and SS application. However, the C content was not significantly affected by the treatments. Dry matter weight and N content of the POM increased by 18.2, 68.2, 99.9%, and 2.4, 14.4 and 14.7% for CR, SS and RF+CR treatments, respectively, relative to the control. After five seasons, 44% of the POM dry matter weight was recovered in the small size fraction (0.25–0.053 mm) compared to 7.2% in the (2.0–0.85 mm) sand size particles. The results suggest that, in nutrients poor sandy clay loam soil of the desert tropics, continuous application of organic residues enhance accumulation of particulate organic matter (POM) in sand size particles.

Keywords: Crop residues, desert tropics, sewage sludge, SOM fractions