

Influence of clay concentration, residue C/N and particle size on microbial activity and nutrient availability in clay-amended sandy soil

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Abstract

The low fertility of sandy soils can be ameliorated by addition of clay-rich soil, but the effect of clay may differ between high and low C/N residues and could be modulated by residue particle size. An incubation experiment was conducted with addition of a clay-rich subsoil (73% clay) to a sandy soil (10% clay). The final clay concentrations were 10, 15, 20 and 30% (w/w). The residues of young kikuyu shoots (C/N 14) and mature wheat shoots (C/N >120) in two particle sizes (0.2-2 and 3-4 mm) were added at 10 g kg⁻¹ soil. Soil respiration, pH, available N, microbial biomass C (MBC), N and P were measured. Cumulative respiration was up to 4-fold higher with kikuyu than with wheat and 30% lower at the highest clay concentration. The MBC concentration was up to 2-fold higher with kikuyu than with wheat. The available N concentration was up to 2-fold higher with kikuyu than with wheat and up to 50% lower at highest clay concentration. Thus, clay addition to sandy soils may reduce nutrient availability by reducing accessibility of plant residues to microbes and binding of nutrients, but this clay effect is not influenced by residue C/N or particle size.

Keywords: C/N ratio, clay, microbial biomass, nutrient availability, plant residue, respiration