

Aggregate-associated soil organic carbon fractions in sub-tropical soil undergoing vegetative restoration

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Abstract

Precise assessment of soil organic carbon (SOC) storage requires understanding how vegetation and soil physicochemical properties differ in SOC fractions. Therefore, we aimed to analyze the dynamics of aggregate-associated, liable organic carbon (LOC) fractions corresponding to depth to clarify the effect of vegetation and soil properties on water stable aggregate (WSA) mineral adsorption in subtropical, red soil with five vegetation restoration regimes. The results showed that the large macro-aggregate fraction dominated the degraded red soil, which had the highest content of dissolved organic carbon (DOC). WSA-associated, easily oxidized organic carbon (EOC) varied from 6.26 to 20.02 g/kg and was not affected by vegetation types. *Schima superba* pure forest (SP) significantly increased DOC (0.38 g/kg on average) and particulate organic carbon (POC, 7.92g/kg on average), which had the highest biomass. Along with soil depth, WSA-associated POC declined, while exhibiting a growth trend with decreasing particle size, e.g., the highest POC was found in silt + clay fraction. The RDA ordination indicated that soil porosity and TN were the main soil parameters that explained the most variance. Meanwhile, the vegetation biomass, except for litter, were all significantly positively correlated with silt + clay fractions. Leaf biomass played the most important role on DOC in macro-aggregate with a 53.42% contribution. For aggregate-related POC, the largest contribution was from the interactions between branch biomass and pH (47.78%) followed by TN (35.1%) of micro-aggregate-related POC. Leaf biomass, silt + clay fractions, and TN can be used as indicators to evaluate the impact of vegetation restoration on WSA-associated SOC fractions. Broad leaved forest or combined with indigenous coniferous species was a better choice for SOC sequestration improvement in the study area.

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