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Linking soil physical properties to the tea bag index for different land uses

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Organic matter decomposition is an important process in global carbon cycling and its rate is altered by various factors. Changes in land use can have a significant effect on decomposition rates, with consequences on CO₂ emissions. The tea bag index (TBI) method is recognized as a simple and effective approach to investigate decomposition. Despite the fact that TBI has been globally applied, most research mainly focuses on soil microbiological aspects; the role of soil physical properties have earned less attention. Linking the soil physical properties to TBI can give us a broad understanding on how land use affects the soil microhabitat, and in turn influence carbon sequestration. Here, we measured the decomposition of green and rooibos tea in a transect from the east to west coast of Denmark across four land uses categorized into two groups (natural and cultivated). The natural group comprised forest and heath, and the cultivated group was composed of cereal and grass. Decomposition rate (k) and stabilization factor (S) were calculated after three months tea bag incubation. Soil physical properties including volumetric water content (VWC), air permeability and relative gas diffusivity (D_p/D_0) were measured at matric potential of -10 and -100 kPa. The cultivated land uses had higher k and S values compared to natural systems. The S was positively correlated with VWC and negatively correlated with D_p/D_0 in natural systems while no relationship was found for cultivated land. However, there was a negative correlation of k -VWC and positive correlation of k - D_p/D_0 in cultivated land, suggesting an impact of soil management and anthropogenic influence on litter decomposition and carbon sequestration.