Artificial macropore effects on carbon storage in soils

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Soil is the largest terrestrial carbon storage body, but also its carbon release caused by land management is corresponded with 20% of the fossil fuel combustion. Artificial macropore (vertical tubular hope filled with fibrous materials) has been installed to degraded soils to enhance infiltration and introduce organic carbon into deep soil layer. Results so far showed soil moisture and organic carbon were increased at the field. The technique was different from cultivation which breaks aggregate and causes soil organic matter decomposition. However, artificial macropore introduces also fresh water and fresh nutrient to the soil body, which might be potential risk for organic matter decomposition. Therefore, the objectives of this study were to conduct solute infiltration experiments with macroporous soil cell and trace the water, nutrients and organic matter content concentration during the incubation period.

Toyoura Standard soil was packed into two-dimensional cell with artificial macrpores inside. Glassfiber was used as a filling material and artificial rainfall with organic matter, nutrients were applied on soil surface. Glucose and benzoic acid were applied as organic matters. 30 C incubation was applied to glucose for three days and benzoic acid for seven days. Hele-Shaw cells were disassembled and soil samples were taken every day for Glucose experiment and two days interval for benzoic acid exmeriment.

Results showed that nutrients and organic matter were partially filtered at soil surface, but they were introduced into soil profile along with water infiltration with macropore structure. Surface organic matter was gradually decomposed but at the deeper profile it resisted decomposition. Oxygen supply was restricted at deeper profile while it was free at soil surface. Our results clearly showed that introducing organic matter along with macroporous structure had advantage over bare soil and cultivation for carbon storage at the soil body.

Keywords: carbon storage, artificial macropore, infiltration

