



Tropentag, September 19-21, 2012, Göttingen -
Kassel/Witzenhausen

“Resilience of agricultural systems against crises”

Vertical Distribution of Dissolved Organic Carbon in a Sandy Soil Treated with Different Quality Litter

BENJAPON KUNLANIT, PATMA VITYAKON

Land Resources and Environment Section, Plant Science and Agricultural Resources, Faculty of Agriculture, Thailand

Abstract

Dissolved organic carbon (DOC) is a constituent of soil solution and plays a key role in many chemical and biological processes in soils, notably forming organo-mineral complexes with micronutrients increasing their availability, cycling of carbon in the soil-plant system, mobilising soil pollutants in soils and acting as microbial substrates. Distribution of DOC in soils is partly determined by chemical composition of organic residues applied to the soils. The objective of this study was to investigate the effects of organic residues differing in chemical composition applied yearly for 13 years on vertical distribution of DOC in a sandy soil. There were five residue treatments: 1) no residue addition, 2) rice straw (RS) (low quality) with low N, lignin, and polyphenols but high C/N ratio and cellulose, 3) groundnut stover (GN) (high quality) with high N but low lignin, polyphenols, and C/N ratio, 4) dipterocarp leaf litter (DP) (low quality) containing low N but high lignin, polyphenols, and C/N ratio, and 5) tamarind litter (TM) (medium quality) with medium N, lignin, and polyphenols. The results showed that GN and TM treatments produced higher total DOC concentrations than DP and RS. Two patterns of vertical distribution of DOC in the soil profile as determined by quality of organic residues could be distinguished. They were 1) low DOC in topsoils but high DOC accumulation in subsoils indicating high vertical DOC movement, and 2) high DOC in topsoils but no accumulation in subsoils indicating low DOC movement. RS had higher DOC in subsoils than other treatments indicating higher vertical movement of DOC. GN treatment had extremely low DOC movement as seen in high DOC accumulation in topsoils and no DOC in subsoils throughout the decomposition period. Meanwhile, DP and TM treatments had moderately low vertical DOC movement as shown by some DOC accumulation in subsoils.

Keywords: Dissolved organic carbon, dissolved organic carbon movement, molecular weight, organic residue quality