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Changes in hydrophobic fractions of SOM in three paddy soils and one marsh soil amended with corn straw

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Abstract
The hydrophobic organic matter contributes to the stability of soil carbon. We hypothesize that hydrophobic organic matter favours carbon sequestration in paddy soils. A 6-month incubation experiment was conducted with maize straw amended to three different paddy soils and one marsh soil of South China. The molecular composition of organic carbon (OC) in incubated soil samples was determined by off-line TMAH-thermochemolysis-GC-MS after 30 and 180 days following the corn straw amendment. Generally, lignin, lipids and polysaccharides were the predominant thermochemolysis products released from these soils. Moreover, loss of polysaccharides and selective preservation of hydrophobic organic matter, including lignin and lipids, were noted with time in both paddy soils and marsh soil. A larger content of hydrophobic matter, namely lignin and lipids, were found in the well-developed paddy soil from the Tai Lake plain (TP) and the red-earth derived paddy soil (RP) rich in free oxyhydrates, than in the paddy soil from southwest China formed on sandstone (PP) and poor in free oxyhydrates. Content of both lignin and lipids was significantly correlated to the amount of increased SOC under corn straw amendment. Moreover, hydrophobic lignin and lipids in soils amended with corn straw were significantly correlated to soil pH, clay and Fed content. Decomposition of hydrophobic components was slower in paddy soils than in marsh soil, especially in TP and RP soils. These findings suggest a greater stability of organic carbon in paddy soils than in the marsh soil, a typical hydromorphic soil, and, thus, an important role played by the lignin and lipids hydrophobic components in carbon sequestration of paddy soils, especially in those rich in free oxyhydrates.
Keywords: Soil organic carbon; Carbon sequestration; Paddy soil; Thermochemolysis; Hydrophobic organic matter