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SOC accumulation in paddy soils under longterm fertilization experiments from South China: increase in microbial quotient and fungi dominance

Genxing Pan, Dawen Liu, Lianqing Li, and Yongzhuo Liu
(gxpan@njau.edu.cn)

Organic carbon sequestration had been observed in significant rates over the last decades of China's rice paddies. In a series of studies using soil samples of some typical rice paddy soils under long term fertilization experiments from south China, the mechanism behind has been characterized to include physical and protection, stabilization by enhanced transformation of recalcitrant molecules. However, the role of changes in microbial community structure has not yet bee illustrated. In this study, topsoil samples after rice harvest were collected of three typical paddy soils under long-term agro-ecosystem experiments from south China and the microbial community structure was analyzed using plate incubation as well as the basal soil respiratory activity was measured in the field when sampling. The results showed that soil organic carbon accumulation was accompanied with an increase in soil microbial quotient and CFU ratio of fungal to bacterial under combined organic/inorganic fertilization. Furthermore, increase in SOC contents was significantly positively correlated with both increase in soil microbial biomass and the ratio of fungi to bacteria. In situ observed soil respiratory activity was observed in negative correlation with the fungi to bacterial ratio. It is concluded that enhanced SOC accumulation in the paddy soils was facilitated by the lower soil respiratory, resultant from the fungal dominance under chemical fertilization combined with organic manure or straw return. Thus, stabilization with changes in soil microbial community structure is involved in organic sequestration mechanism in the rice paddies in addition to physical and chemical stabilization processes.