

Connecting soil dissolved organic matter to soil bacteria community structure in long-term grass mulching apple orchard

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Abstract

Orchard grass mulching management affects soil dissolved organic matter (DOM) components and soil microbial structure. However, the relationship between soil DOM components and microbial community was poorly understood in the long-term grass mulching management apple (*Malus domestica*) orchard. The relationships between DOM (three-dimensional fluorescence excitation-emission matrix (EEM) binding parallel factor analysis (PARAFAC)) and bacterial community structure (16S rDNA amplicon sequencing) in different grass species (14 years grass mulching crown vetch (CV), orchardgrass (OG) and white clover (WC) , control as conventional tillage (CT)) was studied. EEM-PARAFAC identified two humus-like components and one protein-like component. The fluorescence index (FI) showed that the ratio of plant residues and soil organic matter source DOM was CV> WC> CT> OG, and it gradually decreased with the increase of soil depth. Soil bacterial abundance *Proteobacteria*, *Acidobacteria*, *Actinobacteria*, *Gemmatimonadetes* and *Firmicutes* were dominate the bacterial community on the phylum level (0-20cm) layer, which were positively correlated with DOM component 1, component 2 and component 3, but were negatively correlated to the fluorescence index (FI). The orchard grass mulching management affected the variation of DOM composition and intensity mainly in the 0-60cm soil layer. We conclude that the grass mulching played a key role in improving soil DOM content and composition through different types of organic inputs, addition variation of DOM components were closely related to in soil bacterial community structure, such connecting has implications for soil nutrient cycling and carbon conversion in apple orchard ecosystems with long-term grass mulching management.

Keywords: Apple orchard; grass mulching; EEM-PARAFAC; dissolved organic matter; bacteria community.