Biochar regulating humification of livestock manure composting and its improvement on soil quality

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Abstract

Biochar has been considered as a sustainable and eco-friendly practice to improve soil fertility and crop productivity. This study tracked the humification and bacterial community dynamics at different stages of biochar amended sheep manure composting and investigated the response of soil quality. The result showed that biochar accelerates the organic matter degradation and improved nutrient preservation in sheep manure composting. The succession of bacterial community obvious varied during the composting process, *Proteobacteria* predominant in initial stage then shifted into *Firmicutes* in thermophilic and mesophile stages, finally the maturation stage dominant by *Bacteroidota*. The visualization of bacterial co-occurrence network demonstrated more complexity interactions in thermophilic and mesophiles stage. Obviously, 7.5 and 10% biochar amended composts shown highest connections and positive cooperation as well as higher closeness centrality. The addition of biochar-based composting significantly affected the fixation of photosynthetic C and its distribution process in the plant-soil system, increased the biomass, carbon, phosphorus and potassium pools of

above-ground organs, increased the mass density of underground root tissue and its nutrient pool that enabled plants to participate in resource acquisition strategies. The diversity and composition of soil microbial community and the abundance of potential C and N cycling microorganisms were changed. Overall, appropriate biochar addition altered bacterial community succession and strengthens the connection between keystone taxa and other bacteria, the addition of biochar-based composting promotes soil nutrient cycling, optimal in 7.5% biochar amended composts.

Keywords: Bacterial community, Biochar, Co-occurrence, Composting, Soil quality.