



Long-term fertilization of organic manure led to the succession of *Bacillus* community in an alluvial-aquic soil

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Long-term fertilization inevitably influences soil physic-chemical and biological properties. Our previous studies with a long-term fertilization experiment on an alluvial-aquic have revealed that specific *Bacillus* spp. was observed in organic manure-fertilized soils. The current study investigated the effects of long-term fertilization on the succession of *Bacillus* community in soils and their functions. The experiment included three fertilizer treatments: organic manure (OM), mineral fertilizers (NPK) and the control (without fertilizers). The results showed that long-term application of chemical fertilizers didn't increase the quantity of soil microbial population as much as organic fertilizers did, but it played an important role in maintaining the diversity and community structure of indigenous Bacilli. Correspondingly, long-term application of organic manure significantly increased the quantity while significantly decreased the diversity of Bacilli community. The ratio of Bacilli/bacteria was more constant in OM treatment than NPK indicating the stability of the response to long-term organic fertilizers. PCR-DGGE and clone library revealed the succession of *Bacillus* community after long-term application of organic manure and the dominant *Bacillus* spp occurred in the treatment OM was *Bacillus asahii*. Our results also proved that *Bacillus asahii* was not derived from exogenous organic manure, but one of indigenous bacteria in the soil. *Bacillus asahii* was induced by the substrate after the application of organic manure, and gradually evolved into dominant *Bacillus* after 4 to 5 years. With an enzyme assay test of pure species and a soil incubation experiment, we came to a preliminary judgment, that the dominant *Bacillus asahii* didn't significantly influence the decomposition rate of cellulose and protein in the soil, but it promoted the decomposition of lipids, and could also improve the transformation process from fresh organic matter to humus. Applied organic manure led to the succession of soil microbial community, as a response, the changed microbial community and their activities influenced the turnover of exogenous and native soil organic matter, as well as the residuals of decomposition and microbial metabolisms.