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Responses of soil aggregates and bacterial communities to soil-Pb immobilization induced by biofertilizer

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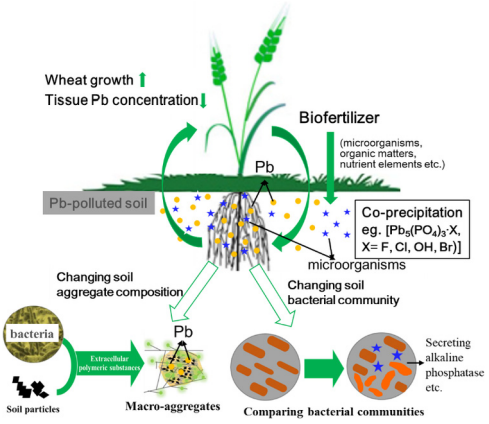
HIGHLIGHTS

- The change of soil microbial communities due to biofertilizers was responsible for immobilizing soil Pb.
- Pb re-distribution in soil aggregates involved in the suppression of Pb-phytotoxicity.
- Biofertilizers were effective in alleviating Pb phytotoxicity.
- Effectiveness of soil-Pb immobilization was biofertilizer dependent.
- Soil physicochemical properties drove the structure of soil bacterial community.

GRAPHICAL ABSTRACT



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ABSTRACT

The objective of this study was to investigate how soil aggregates and bacterial communities responded to soil-lead (Pb) immobilization induced by biofertilizer. Wheat (*Triticum* spp.) was planted in Pb-polluted soil. The re-distribution of Pb in soil aggregates and change of soil microbial communities due to biofertilizers were believed to be responsible for immobilizing soil Pb and alleviating its phytotoxicity. Adding biofertilizer promoted the formation of large aggregates (0.20–2.0 mm) with more mass loading of Pb, and increased soil bacterial diversity and the abundance of beneficial taxa such as those from the phyla Bacteroidetes, Actinobacteria, and Proteobacteria. In addition, there was significant alleviation of Pb availability as indicated by decreases in the values of bioconcentration factors (BCF) (up to 35.7% and 42.3% for roots and shoots, respectively) of wheat and DTPA-extractable Pb in soil (up to 34.4%) receiving fertilizer treatments compared with the CK (no treatment). Similar bacterial community structures and alpha diversities for the biofertilizer treatments and their autoclaved controls were observed, suggesting that physicochemical properties drove the structure of the soil bacterial community. This study introduced a new idea for development of effective strategies to control or reduce soil Pb risks.

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