Acidovorax ebreus LS-1, a Nitrate-Dependent Fe(II)-Oxidizer isolated from Paddy Soil

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It has been well recognized that microbial nitrate-dependent Fe(II) oxidation plays an important role in biogeochemistry of iron and nitrogen. Many nitrate-dependent Fe(II) oxidizers have been isolated from diverse ecosystems including activated sewage sludge, anoxic aquifer sediments, and marine sediments. In this study, *Acidovorax ebreus* LS-1 was firstly isolated from paddy soil field. Phylogenetic analysis of the 16S rRNA gene sequence revealed that *A. ebreus* LS-1 showed a close relationship with members of the genus *Acidovorax*, having the highest similarity of 99% with *A. ebreus* TPSY. Many members of the genus *Acidovorax*, such as *Acidovorax* sp. BoFeN1, *Acidovorax* sp. BrG1, and *Acidovorax* sp. 2AN, have been identified with the ability of nitrate-dependent Fe(II) oxidization. *A. ebreus* LS-1 was able to reduce nitrate in the treatment of LS-1+nitrate, which could be facilitated by the presence of Fe(II). Whereas no obvious Fe(II) oxidation was observed in the treatment of LS-1+Fe(II), Fe(II) oxidation took place only in the treatment of LS-1+nitrate+Fe(II). While nitrite could oxidize Fe(II) abiotically (known as chemodenitrification) in the treatment of nitrite+Fe(II), the presence of *A. ebreus* LS-1 could evidently accelerate the nitrite reduction, N_2O production as well as Fe(II) oxidation. After 9 days of inoculation, scanning and transmission electron microscopy (SEM and TEM) images of the precipitates revealed that *A. ebreus* LS-1 cells were covered by amorphous and laminated structure minerals in both treatments of LS-1+nitrate+Fe(II) and LS-1+nitrite+Fe(II), while only laminated structure minerals were observed in the treatment of nitrite+Fe(II). X-ray diffraction (XRD) and fourier transform infrared (FTIR) spectra of the precipitates confirmed that iron hydroxides, such as lepidocrocite were formed in all treatments. This study identifies a nitrate-dependent Fe(II) oxidizer from paddy soil, which highlights the environmental prevalence and importance of the genus *Acidovorax* in the nitrate-dependent Fe(II) oxidation in natural environments.

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