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Soil particles of different sizes impact the resistance of nitrite oxidizers to diverse fertilization regimes

Nitrite-oxidizing bacteria (NOB) is of great importance in nitrogen-cycle of agricultural ecosystems, and yet their resistances to environmental disturbances under microhabitats remain unclear. In this study, we took samples from the field that was used for a long-term fertilization experiment, including control without fertilizer (CK), chemical fertilization (NPK), NPK and straw (NPKS), NPKS and pig (NPKSP) or cow manure (NPKSC) treatments, to understand how disturbed environments impact the abundance and potential nitrite oxidation activity (PNO) of nitrite oxidizers inhabiting different microenvironment indicated by different sizes of soil particles. PNO was generally increased in the NPK treatment and shown to be highest in the microaggregate, followed by in macroaggregates and silt+clay fractions in all plots. Remarkable variations of the PNO resistance across aggregate size fractions were observed in the NPK(S) plots, with the highest resistant levels in the macroaggregates and lowest in silt+clay fractions. The resistance index of *Nitrobacte*r-like NOB abundance was significantly decreased in silt+clay fractions by the manure fertilization and kept stable in other fractions. The resistances of Nitrospira-like NOB remain unchanged in most cases. We found a significant positive correlation between PNO and nitrite oxidizers abundances, while no remarkable correlation was observed between the resistances of PNO and those of the nitrite oxidizer abundances. Multiple linear regressions showed that *Nitrobacte*r abundance and its resistance have a great contribution to explaining PNO, while *Nitrospira* was not. NOB abundances resistance indexes were associated with both the soil properties and the abundances themselves. This indicated the functional potential of NOB would be less resistant to environmental disturbances than the population itself because the population resistance was also correlated with the size of itself. The macroaggregate+microaggregate fractions may provide a higher protective role against environmental disturbances to the functional microbial guilds.

Biography

Wenli Chen has completed her PhD in 1994 from Huazhong Agricultural University. She has her expertise in Soil Aggregation on the Stability and Function of Microbial Community, and Chemical Behavior of Heavy Metals at the Interface of Soil Mineral-Organic Matter Interactions. She has published more than 60 papers in Soil Biology and Biochemistry, Science of the Total Environment, European Journal of Soil Science, Chemical Geology, Geomicrobiology J et al. and serves as an editorial board member of Frontier in Microbiology.

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