Dissimilatory nitrate reduction and nitrous oxide emissions by *Shewanella denitrificans* OS217T in bog and fen environments

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Peatlands are one of the main sources of N_2O, a potent greenhouse gas which is mainly produced via microbial processes[1]. Peatland ecosystems are generally classified into ombrotrophic (rain-fed) bogs and minerotrophic (groundwater-fed) fens, both of which can produce N_2O[2-3]. However, our understanding of microbial nitrate reduction and N_2O emissions in these two types of peatlands is still not clear, which greatly restricts our assessment and prediction of N_2O emissions from peatlands. Therefore, this study investigated the reaction kinetics of nitrate bioreduction and N_2O emission in simulated bog and fen environments, using *Shewanella denitrificans* OS217T, a representative model bacteria widespread in peatlands[4-6]. The batch experiment results show that the rate of dissimilatory nitrate reduction (DNR) increases initially, then decreases with increasing C/N ratio in the simulated fen environment; the fastest reduction rate is 2.04 μmol/h at C/N=15. In the simulated bog environment, the rate of DNR also initially increases and then decreases with increasing C/N ratio, but the fastest rate was only 1.70 μmol/h. In terms of N_2O emission, the amount of N_2O emission in the bog environment is 16.5%-52.4% higher than that in fen environment. Overall, the results indicate that the rate of DNR in the nutrient-rich fen environment is faster than that in the nutrient-poor bog environment, but the amount of N_2O emission is lower than in the bog environment, which may due to the minerotrophic fen environment being more conducive to the further reduction of N_2O into N_2. These findings improve our understanding of microbial nitrate reduction and N_2O emissions in rain-fed bog and groundwater-fed fen environments, and provide new insights into nitrate bioreduction and N_2O emissions in peatlands in general.

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