

Ammonia Removal Rates in Oxygenated Constructed Treatment Wetland Mesocosms

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Wastewater treatment facilities often include “constructed treatment wetlands” that are capable of efficiently removing nitrate from secondary effluent, but these wetlands are generally less effective at removing ammonia. Dissolved oxygen may be responsible for this inefficiency. To test this hypothesis we constructed oxygenated and unoxygenated wetland mesocosms and quantified changes in nitrogen loads. Each wetland mesocosm had similar sediments and plants (*Typha* spp.) in 29.5 liters of water and each mesocosm was replicated for 4 independent observations. The inflowing artificial wastewater was loaded with 10 mg/L ammonia; hydraulic retention times and hydraulic loading rates were 5 days and 4.3 cm/d, respectively. At the end of the experiment we constructed 16S rDNA libraries to characterize the microbial community found in these different mesocosms. Analysis of mesocosm effluent showed that the unoxygenated systems removed 40 mg-N/m²/d while oxygenated systems removed 450 mg-N/m²/d ($P < 0.05$). Thus, oxygenation increased the removal efficiency from 10% to 95%. Although ammonia concentrations were drastically reduced, nitrate concentrations in the oxygenated mesocosms increased but were largely unchanged in the unoxygenated mesocosms. We successfully generated 16S rDNA libraries (ca 96 clones per mesocosm) using “universal” PCR primers and sequencing is complete. Our analysis will focus on the composition and diversity of bacteria from individual mesocosms to help identify which agent(s) are likely to be responsible for nitrogen oxidation.