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Long term effect of biochar on the efficiency of subsurface flow wetland pollutant treatment

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ABSTRACT

Biochar is a product pyrolyzed from agricultural biomass waste and has been gradually applied to promote the pollutants removal efficiencies in constructed wetland (CW). To investigate the long-term effects of biochar on subsurface flow CW, different biochar doses (40%, 30%, 20%, 10%, and 0% v/v) were added to five constructed microcosm wetlands (named BW-40, BW-30, BW-20, BW-10, and CW-K), respectively. The results showed that the concentration of effluent dissolved oxygen (DO) was less than 0.5 mg L^{-1}, and there were no significant correlations between biochar addition and the effluent DO. Additionally, the effluent pH in BWs was almost decreased to 7.0 during the operation. However, the oxidation–reduction potential (ORP) and the conductivity (Cond) were found to be significantly increased and decreased with the increasing of biochar. After a long-term operation, the stable chemical oxygen demand removal rates, higher than 90%, were observed in all CWs, indicating no significant effects resulted from adding biochar. At the early operating stage, the ammonium (NH_4^+–N) removal showed a cascade increase with the increase of biochar, while the unremarkable differences were found among all CWs after a long run. However, the NH_4^+–N removal efficiency could be improved by adding massive biochar.

Keywords: Biochar; Subsurface flow constructed wetland; Organic matter removal; Nitrogen removal; Long-term

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