Enhanced removal of organic matter and nitrogen in a vertical-flow constructed wetland with *Eisenia foetida*

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**ABSTRACT**

Constructed wetlands (CWs) have been widely applied for water quality amelioration. However, soil macrofauna usually considered as ecosystem engineers are scarce in wetlands. We hypothesize that introduction of an epigeic earthworm *Eisenia foetida*, a common ecosystem engineer, into wetlands would improve removal of organics and nitrogen in vertical-flow CWs. This paper quantitatively analyzed the effects of addition of *E. foetida* on removal of organic matter and nitrogen in vertical-flow wetlands. Results demonstrated that average removal efficiencies of COD, NH$_4^+$–N, and TN in the earthworm-amended wetlands were 15.7, 21.3, and 20.6%, higher than those observed in control wetlands with no addition of *E. foetida*, respectively. Moreover, the improvement was mainly achieved in the upper layer (0–20 cm) matrix, where *E. foetida* inhabited. Meanwhile, the total bacterial count, the numbers of ammonifier, ammonia-oxidizing bacteria and nitrite-oxidizing bacteria, as well as urease and protease activities in the upper layer of the earthworm-amended wetlands were higher than those in control wetlands. Therefore, it is suggested that *E. foetida* improved the removal of nitrogen and organics by stimulating the proliferation of bacteria and enzyme activities.

**Keywords:** Constructed wetland; Earthworm; Microorganism; Nitrogen; Organic matter