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Feasibility investigation of various leaves as carbon sources for biological denitrification

Bogo A-H. Orou Wagou[a], Junting Zhao[a], Gaigai Cao[a], Yunpeng Shen[b], Zhenjun Wu[a], Dongjin Wang[a], Qiaochong He[a,*]

[a]*School of Environmental Engineering, Henan University of Technology, Zhengzhou 450001, China, Tel. +86 10 67756039; email: qiaochonghe@haut.edu.cn (Q. He), Tel. +86 13027601750; email: haaqorouwagou@gmail.com (B. A-H. Orou Wagou), Tel. +86 18623717923; email: zjtyjk@126.com (J. Zhao), Tel. +86 18039571827; email: gaig2022@163.com (G. Cao), Tel. +86 13629841966; email: wuzhenjun@haut.edu.cn (Z. Wu), Tel. +86 18623718015; email: djwan@haut.edu.cn (D. Wan)*
[b]*School of Biological Engineering, Henan University of Technology, Zhengzhou 450001, China, Tel. +86 18623711885; email: shenswjs@haut.edu.cn (Y. Shen)*

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ABSTRACT

Nitrate (NO_3^-) pollution has a significant effect on aquatic ecology. This study aimed to remove NO_3^- from water using heterotrophic denitrification. Denitrification performance using three different leaves as carbon sources for heterotrophic denitrification were investigated in side-by side microcosm studies, including leaves of *Ginkgo biloba* (*Gb*, Gingko), *Firmiana simplex* (*Fs*, Sycamore), and *Cerasus serrulata* (*Cs*, Oriental cherry). Results showed that leaves can reduce and remove nitrate from water with various removal efficiencies at varying dosages for different species of leaves. Compared to gingko and sycamore, oriental cherry presented a higher denitrification rate. Furthermore, anaerobic digestion experiment for the leaves revealed that the biodegradability and bioavailable of oriental cherry was higher than those of gingko and sycamore. Therefore, oriental cherry was selected for a continuous experiment, in which the influence of hydraulic retention time (HRT) on NO_3^- removal was investigated. When the HRT was 6 h, NO_3^- was not completely removed, while NO_3^- was removed at HRT = 12 h, with no accumulation of NO_2^- or NH_4^+ even at low temperatures. Results demonstrated that oriental cherry can effectively reduce nitrate from water to the allowable range of water quality under the appropriate HRT. Therefore, oriental cherry leaf-mediated heterotrophic denitrification is a suitable denitrification process for NO_3^- removal from water.

Keywords: Nitrate removal; Leaves; Carbon sources; Heterotrophic denitrification; Feasibility investigation

* Corresponding author.