Environmental Engineering and Management Journal

March 2013, Vol.12, No. 3, 565-573
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

INFLUENCE OF NITRATE LOAD ON SULFUR TRANSFORMATIONS IN THE RHIZOSPHERE OF *Juncus effusus* IN LABORATORY-SCALE CONSTRUCTED WETLANDS TREATING ARTIFICIAL DOMESTIC WASEWATER

Shubiao Wu[1*], Arndt Wiessner[2], Mareike Braeckevelt[2], Uwe Kappelmeyer[2], Renjie Dong[3], Jochen A. Müller[2], Peter Kuschk[2]

[1]Key Laboratory of Agricultural Engineering in Structure and Environment of the Ministry of Agricultural, College of Water Conservancy & Civil Engineering, China Agricultural University, 100083, Beijing, P.R. China
[2]Department of Environmental Biotechnology, Helmholtz Centre for Environmental Research − UFZ, 15 Permoserstrasse, Leipzig D-04318, Germany
[3]College of Engineering, China Agricultural University, 100083, Beijing, P.R. China

Abstract

Two laboratory-scale constructed wetlands planted with *Juncus effusus* were used to investigate the effect of nitrate load on the sulfur transformation dynamics related to the removal of organic carbon and ammonium. Organic carbon was removed at a constant high mean level of 80% (inflow of 25 mg/L total organic carbon), irrespective of the nitrate load. In contrast, sulfate reduction responded immediately to the presence or absence of nitrate in an opposing manner, indicating a high abundance of sulfate-reducing bacteria along with an inhibitory effect of nitrate on sulfur reduction. In general, sulfate reduction as well as nitrate reduction were at relatively high mean levels of 70% (inflow of 10 mg/L SO_4^{2-}-S) and 87% (inflow of 15 mg/L NO_3^--N), respectively. In addition, the presence of elemental sulfur in the range of 30% of the decreased sulfate sulfur simultaneously indicated a re-oxidation of sulfide. The initially relatively high removal of approximately 80% (33.5 mg/d) of ammonium decreased to nearly 10% (18.2 mg/d) after enhancing the sulfate reduction and decreasing the redox potential by stopping the nitrate load. The results strongly suggest a highly sensitive correlation between the N and S cycles in the root-surrounding zones of constructed wetlands.

Key words: Ammonium removal, artificial sewage, constructed wetland, *Juncus effusus*, nitrate reduction, sulfur transformation

Received: November, 2011; Revised final: February, 2012; Accepted: February, 2012

[*] Author to whom all correspondence should be addressed: e-mail: wushubiao@gmail.com; Phone: +86-10-62737852; Fax: +86-10-62737885