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## COLIFORM BACTERIA REMOVAL FROM SEPTIC WASTEWATER IN A PILOT-SCALE COMBINED CONSTRUCTED WETLAND SYSTEM

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### Abstract

Surface and ground water in rural areas where there is a lack infrastructure of sewage is exposed to a risk of bacteriological contamination. Combined constructed wetland (CW) systems appear to be the most feasible solution in preventing bacteriological contamination of waters in these areas. In this study, a pilot-scale combined CW system was designed to remove coliform source pollution in surface water. The system comprised a vertical, non-vegetated CW (Stage I), a horizontal-subsurface flow bed vegetated with *Iris* (Stage II), and a vertical-subsurface flow bed vegetated with *Phragmites* (Stage III) connected in series. Coliform bacteria counts (cfu/100 mL) were made in the input and output of all stages under different hydraulic and loading conditions. The average inflow coliform bacteria in stages I, II and III were 4.26, 3.51, and 2.07 for fecal coliforms (FC) and 5.15, 4.38 and 3.05 cfu/100 mL for total coliforms (TC), respectively. The system was capable of significantly reducing FC and TC in septic wastewater effluent. The second stage removed approximately 95%, with higher elimination than in stage II and III. The average overall reductions of fecal and total coliforms were approximately 99%. No seasonal effects on the average removals were observed. Average removal efficiencies were affected by hydraulic residence time (HRT) and input bacteria counts. TUKEY-HSD tests demonstrated that there were statistically significant differences between stages in coliform removal. The results of this study demonstrated that removal efficiency of the system may enhanced due to a longer HRT when single-stage systems are connected in series.

*Key words:* coliform removal, constructed wetlands, natural wastewater treatment

*Received:* November 2009; *Revised final:* December, 2011; *Accepted:* January 2012

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