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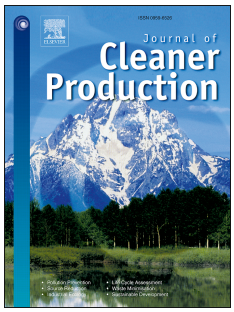

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INDUSTRIAL WASTEWATER TREATMENT IN CONSTRUCTED WETLANDS PACKED WITH CONSTRUCTION MATERIALS AND AGRICULTURAL BY-PRODUCTS

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ABSTRACT

This paper reports pollutant removal performances from mixed industrial wastewater employing subsurface flow constructed wetland systems in Bangladesh. Two parallel hybrid wetland trains were established; each train included a vertical flow (VF) followed by a horizontal flow (HF) wetland. One hybrid system was packed with construction materials (i.e. recycled bricks), whereas the other system included agricultural by-products (i.e. sugarcane bagasse). All wetland units were planted with *Canna indica*. The hybrid trains were operated under non recirculation and recirculation phases; input hydraulic loading across each VF system ranged between 219.3-438.0 mm/d. Mean nitrogen, organics, solids, phosphorus and color removals across the hybrid systems were 67.5-80.0, 74.0-85.0, 55.0-95.0, 64.0-89.0 and 46.0-83.0% respectively. Lower input biodegradation ratio influenced organics removal routes in wetland systems that employed recycled bricks. In contrast, organic contents of sugarcane bagasse material supported microbial routes in the other system. VF wetland with organic media achieved higher TN removal rates (1.82 g/m^2 d), due to internal carbon (C) generation. Higher phosphorus removals (89.0%) were observed in hybrid system packed with recycled brick media, due to adsorption process. HF wetland packed with recycled brick was efficient in removing color compounds, whereas the other HF system (with organic media) showed high sulfate removals. Nitrogen and BOD removal improvement was observed in VF wetland (packed with recycled brick media) during recirculation period; in contrast, effluent recirculation reduced removal rates of such pollutants in VF system that employed organic media. In general, this study shows potential application of particular materials as the main media of wetland systems, to achieve pollutant removals from industrial wastewaters in Bangladesh.

KEYWORDS: Constructed wetlands; industrial wastewater; media; recirculation; removal.