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Integrated system for the treatment of blackwater and greywater via UASB and constructed wetland in Egypt

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ABSTRACT

Municipal wastewater separation into black and greywater proved to be an efficient system to prevent the contamination of greywater, reduce the volume of fecal contaminated wastewater as well as reducing the cost of treatment. Meanwhile, up-flow anaerobic sludge blanket (UASB) proved to be a cost effective pretreatment system for wastewater. On the other hand, constructed wetlands (CWs) offer a low-cost alternative for wastewater treatment in developing countries, particularly in the arid and semi-arid areas. In the present study, two separate UASB reactors were used as a primary treatment step followed byCW for the treatment of blackwater and greywater separately. The hydraulic residence time (HRT) of UASB was kept constant at 6 and 24 h for the two reactors, while the organic loading rates (OLRs) were 1.88 and 1.16 kg/m^3/d for the treatment of blackwater and greywater, respectively. The removal efficiency of chemical oxygen demand (COD) in the UASB reactor was about 60% for greywater and 68% for blackwater. Further improvement of the quality of the treated wastewater was obtained after the application of the horizontal subsurface flow CW. The overall results indicated that the integration between the UASB and the CW proved to be very efficient for the treatment of blackwater. The overall removal of the key constituents represented by COD, biological oxygen demand (BOD) and total suspended solids (TSS) in the final effluent was 87.7%, 89.5% and 94% for greywater and 94.2%, 95.6% and 94.9% for blackwater. It therefore, recommended that the combination of UASB and CW is an effective system for the treatment of blackwater and greywater.

Keywords: UASB; Constructed wetland; Blackwater; Greywater; Wastewater

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