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Blackwater treatment via combination of sedimentation tank and hybrid wetlands for unrestricted reuse in Egypt

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ABSTRACT

The present study aims at investigating the performance of hybrid constructed wetlands (CWs) for blackwater treatment. A pilot study of real blackwater samples was conducted in this investigation. This research describes an integrated system consisting of the sedimentation process as primary treatment followed by hybrid horizontal–vertical flow wetland for the treatment of concentrated blackwater as a strong wastewater. The results showed that the sedimentation tank was able to remove about 56.8%, 64.8%, and 58.0% for TSS, BOD, and COD, respectively, for the raw blackwater. When the effluent of the sedimentation tank was further treated by the subsurface horizontal wetland, the removal efficiency of TSS, BOD, and COD increased to 82.9%, 88.0%, and 87.1%, respectively. For upgrading the treated effluent, it was further subjected to vertical wetland. The overall removal of the pollution parameters of the combined system reached 97.4%, 98.0%, and 98.5% for TSS, BOD, and COD, respectively. As a result, the final effluent complied with the National Regulatory Standards for unrestricted water reuse. The present investigation concluded that the hybrid CWs offer a low-cost alternative for wastewater treatment, according to the climate of Africa, Middle East, arid, and semi-arid areas. Such hybrid system could be implemented easily if the land area is available.

Keywords: Blackwater; Sedimentation tank; Hybrid wetlands; Wastewater treatment; Unrestricted water reuse; Constructed wetland

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