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Effect of hydraulic loading rate and pollutants degradation kinetics in two stage hybrid macrophyte assisted vermifiltration system

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RESEARCH HIGHLIGHTS

- Effect of HLR on performance of two stage hybrid MAVF has been evaluated.
- First order kinetics and theoretical OTR of the reactors have been calculated.
- Comparison of results has been done with previously reported MAVF data.
- Growth of *Canna indica* and population gowth of *Eisenia fetida* have been analysed.

Abstract

Three cylindrical vertical flow (VF) (1st stage) and three horizontal flow (HF) vermifilters (2nd stage) were designed and planted with *Canna indica* to study the effect of HLR. The vermifilters were loaded (to VF) with synthetic dairy wastewater at three HLRs of 0.3, 0.6 and 0.9 m d^{-1} and operated for 100 days. Removal rate constants were higher at HLR 0.6 m d^{-1} and the value of K_{BOD5}, K_{COD}, K_{NH4+-N}, K_{TN}, K_{TP} (for VF+HF unit) were 0.51, 0.41, 0.32, 0.23, 0.26, respectively. Efficiency of VF reactor were higher than HF reactor in case of all types of pollutants. The average removal of BOD_5 was found to be 90.43 % at HLR 0.3 m d^{-1} and 85.75 % at HLR 0.6 m d^{-1}, while for COD it was found to be 85.59 % and 79.64 %, respectively.In the present study, the overall theoretical oxygen transfer rate (OTR) for HLR 0.3, 0.6 and 0.9 m d^{-1} (VF+HF unit) were