



Performance Evaluation of Membrane-Based Septic Tank and Its Reuse Potential for Irrigating Crops

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ABSTRACT:

Membrane technology, being the most emerging wastewater treatment option, has gained substantial importance with the massive objective of the reuse potential of wastewater. Keeping this in view, the present study was conducted with the rationale to evaluate the performance efficiency of membrane-based septic tank (MBST), and its reuse perspective for irrigating crops. The septic tank was designed by submerging a woven fiber microfiltration membrane module to treat domestic wastewater. Three crops *Triticum aestivum* (wheat), *Coriandrum sativum* (coriander), and *Mentha arvensis* (mint) were selected to be irrigated with treated MBST effluent, untreated wastewater, and tap water (as a control) for comparative growth analysis. Two pathogenic strains, *Escherichia coli* and *Salmonella* sp. were selected as reference microbes and their translocation rate was observed in root, shoot, and leaves. Upon maturity, the roots, shoots, and leaves of the above-mentioned plants were aseptically removed for microbiological analysis. Strains were analyzed, using analytical profile index and PCR analysis. Maximum removal efficiencies for MBST in terms of chemical oxygen demand (COD), turbidity, nutrients deduction (phosphorus), and indicator bacteria (*Escherichia coli*) were found to be 73, 96, 48, and 88%, respectively. Significant bacterial load reduction ($p < 0.001$) in terms of *E. coli* (3.8 log CFU/100 mL) and helminths (2 eggs/L) was observed in treated water. High plant yield was observed when irrigated with treated water as compared to tap water, as minimal nutrient removal (48%) was recorded in treated water, with the germination percentage of 88.8%.

Keywords: PCR analysis; irrigating crops; membrane-based septic tank; wastewater

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