Abstract

The present study evaluated the potential of bacterial augmented floating treatment wetlands (FTWs) for Malachite green (MG) enriched industrial wastewater treatment. FTWs were vegetated with bacteria, plants, and plants and bacteria both. Various treatments of two aquatic plants i.e., *Eichhornia crassipes* and *Pistia stratiotes* were designed and employed in FTWs to study these plants' potential with and without bacterial inoculation for wastewater treatment. Study results indicated that out of two controls and six experimental treatments developed, treatment T6 (aquatic plant inoculated with bacterial consortium added in MG enriched industrial wastewater) of both aquatic plants performed well for wastewater treatment. Bacteria (*Pseudomonas putida* and *Pseudomonas* sp.) inoculated in treatments were isolated from aquatic plants and have the potential for MG dye decolorization up to 82.37 ± 0.31% and 70.77 ± 0.35%, respectively, and were also positive for some of the well-known plant growth promoting traits. In treatment T6, *E. crassipes* and *P. stratiotes* decolorized dye upto 97.53 ± 1.51% and 92.18 ± 1.15%, lowered down electrical conductivity (EC) values to 0.311 ± 0.01 (from 1.526 ± 0.01) and 0.363 ± 0.03 mS cm-1 (from 1.543 ± 0.01), pH went down to 7.16 ± 0.064 (from 8.0 ± 0.1) and 7.34 ± 0.08 (from 8.0 ± 0.1) and total dissolved solids (TDS) values declined to 0.369 ± 0.020 (from 0.951 ± 0.006) and 0.479 ± 0.010 (g/L) (from 0.949 ± 0.009), respectively. Bacterial inoculation not only helped aquatic plants in dye decolorization in FTWs, but they also helped in aquatic plants growth promotion. Phytotoxicity assay of FTWs treated wastewater was also performed on *Pisum sativum* seeds and percentage seed germination of 98.37 ± 0.15% for *E. crassipes* and 93.47 ± 0.06 % for *P. stratiotes* was obtained which is relatively close to tap water seed germination i.e., 99.70 ± 0.52%. The high rates of dye decolorization, decreased EC, pH, and TDS values, water comparable phytotoxicity results of treatment T6 (for both *E. crassipes* and *P. stratiotes* plants) treated wastewater strengthen the role of bacterial inoculation in FTWs. From the above results, it can be concluded that FTWs inoculated with bacteria is not only an innovative, cost-effective, and environment-friendly option for wastewater treatment but also a promising technology and has the potential to replace conventional wastewater treatment methods.