

Energy production and wastewater treatment using *Juncus*, *S. triqueter*, *P. australis*, *T. latifolia*, and *C. alternifolius* plants in sediment microbial fuel cell

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ABSTRACT

Sediment microbial fuel cell (SMFC) is a simple and low-cost wastewater treatment technique that uses natural plants to treat a variety of contaminates. It is able to improve the wastewater quality and make it possible for reuse and producing energy along with the treatment process. In the present study, a comparison has been made between five aquatic and semi-aquatic plants, *Juncus*, *Schoenoplectus triqueter*, *Phragmites australis*, *Typha latifolia*, *Cyperus alternifolius*, in order to detect the optimal plant in wastewater treatment to generate energy. Vertical flow constructed wetland adopted in feeding the SMFC with Al-Rustumiya crude wastewater. Samples of the treated wastewater were taken every 3 d. The results showed a maximum reduction in chemical oxygen demand with a value of 91.4%, 90.4%, 86.6%, 73.3%, and 72.3% for *S. triqueter*, *T. latifolia*, *P. australis*, *Juncus*, and *C. alternifolius*, respectively, and total suspended solids value of 86%, 80%, 79.6%, 78.4%, and 64%, and PO₄ values of 70.8%, 66.6%, 66.6%, 62.5%, and 58.3% for *P. australis*, *S. triqueter*, *C. alternifolius*, *T. latifolia*, and *Juncus*, respectively. For NO₃ removals were 81.4%, 80.9%, 80.9%, 80%, and 66.6% for *C. alternifolius*, *T. latifolia*, *P. australis*, *S. triqueter*, *Juncus*, and respectively. Heavy metals were removed as to be non-detected by the testing device from the first sampling process after initial values of 0.07 ± 0.01 ppm for Pb, 0.04 ± 0.02 ppm for Cu, 0.02 ± 0.01 ppm for Cd. The initial pH was 7.9 ± 0.02 and decreased to the minimum possible value of 6.7 ± 0.08 for *C. alternifolius* electricity generation performed better in *Cyperus* and *P. australis* and reached the maximum output of 43 ± 4 mV and 34 ± 3.1 mV on the third day of operation. The findings illustrate that all of the used species were proficient accumulator plants for phytoremediation of these pollutants and could be arranged ascendingly, *P. australis*, *C. alternifolius*, *S. triqueter*, *T. latifolia*, *Juncus*.

Keywords: Sediment; Microbial; Wetlands; Vertical flow; Aquatic macrophyte; Heavy metals; Phytoremediation

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