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STUDY OF BIOELECTRICITY GENERATION POTENTIAL OF A MICROBIAL FUEL CELL; UTILIZING DOMESTIC WASTEWATER AND CYANOBACTERIA

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Abstract

Microbial fuel cells (MFCs) generate bio-electricity as an alternative green energy source by consuming waste compounds. Subsequently, there is a great opportunity of use cyanobacteria as catholyte in the MFC systems for wastewater treatment along with power generation. The present study records the bioelectricity generation potential of a MFC, utilizing domestic wastewater and cyanobacteria. Pure culture of *Chroococcu*s sp. used to fill the cathode compartment and rice washed wastewater to the anode compartment. Zinc $(4\times4)cm^2$ for cathode and graphite rod $(2\times4)cm^2$ for anode were placed in compartments and two chambers were separated using cation exchange membrane (CMI-7000S). The external resistor (0.33Ω) was connected to the electrodes. Distilled water was used in the cathode to maintain the control setup of the MFC. Physico-chemical parameters; Nitrate, Nitrite, Chemical Oxygen Demand (COD) and Orthophosphate concentrations in anode compartment of both experimental and control setups were measured for six hours at one hour intervals. The voltage and current were measured, and power density and current density were calculated at each sampling in experimental and control setups. The maximum voltage generated by the MFC was 880± 0.5mV with a current of 2666.67mA, where the calculated maximum current and power densities were 1799.37mA cm^{-2} and 1583.45mW m^{-2}, respectively. The results reveled a significant reduction of COD by 52.52%, N-Nitrate by 22.13%, N-Nitrite by 17.64% and Orthophosphate by 17.19% in the wastewater treated in MFC compared to the control with an increase of the optical density in the cathode compartment by 12.1%. Therefore, the laboratory scale MFC employed in this study could treat domestic wastewater while generating bio-electricity as alternative power for future energy crisis as a cost-effective green microbial solution.

***Keywords**: Chroococcu*s sp., Graphite electrodes, Microbial fuel cell, Rice washed wastewater, Wastewater treatment