ABSTRACT

Microbial Fuel Cell (MFC) is a bioelectrochemical system that utilizes microbial metabolism to convert chemical energy into electrical energy. Saccharomyces cerevisiae is frequently employed as a biocatalyst in MFCs owing to its fermentative capacity; however, its bioelectrochemical performance is influenced by lighting conditions. This study analyzes the effect of dark and light treatments with varying exposure durations on the metabolism and electrochemical characteristics of Saccharomyces cerevisiae in an MFC system. Testing was conducted in half-cell (pH analysis, alcohol content, cyclic voltammetry, and RDS) and full-cell configurations (voltage, maximum power density, biofilm, and anode mass) over a 48-hour operating cycle with variations in daily light duration. The results show that the decrease in pH is associated with the formation of ethanol and organic acids, while cyclic voltammetry indicates electron transfer through cytochrome a_3 with diffusion-controlled reaction characteristics. The highest electron transfer rate constant (k_s) was obtained under the 48-hour dark treatment, at 1.76 ± 0.076 s^{-1}, with an average voltage of 0.0531 V. This treatment also exhibited the best performance based on electrochemical parameters and biofilm formation compared to the other variations.

Keywords: *Microbial Fuel Cell, Saccharomyces cerevisiae, dark-light conditions, electrochemical characteristics, biofilm*