Influence of Anodic Coculture on Dairy Wastewater Treatment and Synecocystis sp. Production in an Algal Assisted Microbial Fuel Cell

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Abstract

The development of alternate energy resources is of great interest to meet the growing energy demand. Herein, we demonstrate the production of bioelectricity as well as Synechocystis sp. from dairy industry wastewater using an algal assisted microbial fuel cell (AAMFC) under different initial anodic microbial loads comprising Enterobacter aerogenes and Rhodobacter sphaeroides. Synechocystis sp. and municipal solid waste leachate present in the cathode chamber served as terminal electron acceptors. Synergistic interaction of dark and photo-fermentation at the anode region was better at a ratio of 1:9, which gave power density of 114±6 mW/m2 and COD removal of 84%. This showed higher Synechocystis sp. and lipid productivity besides highest DO level of 9.2 mgL-1 in the cathode chamber. Better performance of AAMFC was observed at pH 7.5. E. aerogenes was found to grow much faster and dominant volatile fatty acid (VFA) produced was acetic acid. Carbon dioxide fixation by Synechocystis sp. exhibited biomass and lipid productivity of 156.3±1.5 and 28.8± 4.2 mg L-1 d-1, respectively with 88.6% and 89.4% total nitrogen and phosphorous removal.

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