Cultivation of Nannochloropsis sp. microalgae in palm oil mill effluent (POME) media for phycoremediation and biomass production: Effect of microalgae cells with and without beads

ABSTRACT

Immobilization of microalgae presents a sustainable approach for rapid and effective phycoremediation such as wastewater treatment and CO2 biosequestration. In this study, microalgae cells of Nannochloropsis. sp immobilized on sodium alginate beads were cultivated in 10% Palm Oil Mill Effluent (POME) media for wastewater treatment and biomass production. The microalgae cells growth and the rate of Chemical Oxygen Demand (COD) reduction under immobilized microalgae conditions were monitored during the treatment process and compared to that of suspended free-cells. It was found that the immobilized microalgal cells demonstrated a higher biomass concentration of 1.27 g/L and COD reduction of 71% than the suspended free-cells which demonstrated a biomass concentration of 0.37 g/L and COD reduction of 48%. The immobilized microalgae cells showed a systematic growth during the treatment process, demonstrating the suitability of sodium alginate beads as a biocompatible polymeric carrier for microalgal immobilization. The sodium alginate beads enabled the transport of nutrients from the POME medium through the membrane pores of the beads to support microalgae growth. The results indicated that the sodium alginate-immobilized Nannochloropsis sp. cells could be a viable technology for sustainable and continuous POME treatment with simultaneous biomass production. This will contribute to research efforts towards the development of new and improved technologies for POME treatment.

Keyword: Wastewater treatment; Microalgae; Biomass; COD; Biopolymers; Sustainability