



Efficiency of *Botryococcus* sp. in photobioreactor treatment system for nutrient removal from greywater

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ABSTRACT

Direct discharge of household bathroom greywater into drains is one of the main causes of eutrophication in natural water bodies. The current work aimed to study the removal of nutrients (ammonium, total Kjeldahl nitrogen, and orthophosphate [PO_4^{3-}]) from greywater (collected from four houses) by phycoremediation process using *Botryococcus* sp. in a photobioreactor. A laboratory-scale greywater treatment system was set up by using a photobioreactor tank with *Botryococcus* sp., and the treatment process was conducted at ambient temperature of 25°C–35°C for 21 d. The results reveal that greywater has pH between 6.1 and 8.27, biochemical oxygen demand (BOD_5) and chemical oxygen demand values in the range from 46 to 199 mg/L and from 76 to 438 mg/L respectively, and total suspended solids ranged from 29 to 245 mg/L. $\text{NO}_3\text{-N}$ ranged from 1.03 to 7.54 mg/L and PO_4^{3-} ranged from 0.12 to 22.7 mg/L. The maximum growth of *Botryococcus* sp. with an initial inoculum of 10^5 cell/mL was between 6 to 8 d (1.96×10^6 cell/mL). Meanwhile, an initial inoculation of 10^6 cell/mL resulted in maximum growth after 7 d (2.89×10^7 cell/mL) in greywater collected from House A. The removal of ammonium by *Botryococcus* sp. reached 87% from greywater in House A after 21 d and 77% from greywater in House D. In contrast, the total Kjeldahl nitrogen removal was 99.7% and the removal of $\text{PO}_4\text{-P}$ was 78.7%. These results prove the efficiency of *Botryococcus* sp. in $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$ removal from greywater. It can be concluded that the photobioreactor with *Botryococcus* sp. used in the present study exhibited an efficiency for removing the nutrients from bathroom greywater.

Keywords: *Botryococcus* sp.; Microalgae; Photobioreactor; Phycoremediation; Personal care products

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