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WATER PHYCOREMEDIATION OF ORGANIC AND INORGANIC TARGET COMPOUNDS

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Abstract

Phycoremediation for wastewater treatment has been recognized as an alternative and promising approach to wastewater treatment and has received considerable attention in recent years. The ability of microalgae species to remove organic and inorganic contaminants in wastewater and their ability to survive under extreme environmental conditions make them excellent candidates for using in a final wastewater polishing step. The main objective was to evaluate three species, in monocultures of single-celled photosynthetic microalgae (*Chlorella vulgaris*, *Desmodesmus subspicatus* and *Raphidocelis subcapitata*) regarding the removal and biotransformation of organic and inorganic compounds of interest usually present in domestic effluents, for future application in decentralized wastewater treatment systems (DWWTS) as a final polishing step. The microalgae were exposed to a solution with 600 mg L^{-1} of COD, 24 mg L^{-1} of total nitrogen and 10 mg L^{-1} of phosphate, in mineral water in two different densities (10^5 and 10^7 algae mL^{-1}), with constant aeration, temperature 25-28°C and photoperiod of 16:8h (light:dark). After 96h, algae biomass production was observed for the three microalgae species, with an increase in dry biomass of 17.3-times in the density of 10^5 algae mL^{-1} and 11.4-times in 10^7 algae mL^{-1}, in comparison with two controls established with mineral water and culture medium, which had biomass production of 2-times and 8.7-times respectively. COD reduction was related to algae density, being higher in 10^7 algae mL^{-1} bioassays. However, in all bioassays, the COD reduction was higher than 78%. The highest nitrogen removal (80% or 19.1 mg L^{-1}) was observed in the *C. vulgaris* bioassay (10^7 algae mL^{-1}). However, *D. subspicatus* promoted the highest phosphate removal (34% or 3.8 mg L^{-1}). In summary, nitrogen and phosphate removals considering all bioassays reached in average 68% and 21%, respectively. These results reinforce the potential of using microalgae as a final polishing step in a DWWTS.

Keywords: Phycoremediation, Microalgae density, Algae biomass, Biotransformation, Tertiary effluent treatment.

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