Review Appl Microbiol Biotechnol. 2017 Apr;101(7):2659-2675.
doi: 10.1007/s00253-017-8184-x. Epub 2017 Feb 17.

Microalgae-based advanced municipal wastewater treatment for reuse in water bodies

Jing-Han Wang [1], Tian-Yuan Zhang [1], Guo-Hua Dao [1], Xue-Qiao Xu [1], Xiao-Xiong Wang [1], Hong -Ying Hu [2 3]

Affiliations

PMID: 28213735 DOI: 10.1007/s00253-017-8184-x

Abstract

Reuse of secondary municipal effluent from wastewater treatment plants in water bodies could effectively alleviate freshwater resource shortage. However, excessive nutrients must be efficiently removed to prevent eutrophication. Compared with other means of advanced wastewater treatment, microalgae-based processes display overwhelming advantages including efficient and simultaneous N and P removal, no requirement of additional chemicals, O_2 generation, CO_2 mitigation, and potential value-added products from harvested biomass. One particular challenge of microalgae-based advanced municipal wastewater treatment compared to treatment of other types of wastewater is that concentrations of nutrients and N:P ratios in secondary municipal effluent are much lower and imbalanced. Therefore, there should be comprehensive considerations on nutrient removal from this specific type of effluent. Removal of nutrients and organic substances, and other environmental benefits of microalgae-based advanced municipal wastewater treatment systems were summarized. Among the existing studies on microalgal advanced nutrient removal, much information on major parameters is absent, rendering performances between studies not really comparable. Mechanisms of microalgae-based nitrogen and phosphorus removal were respectively analyzed to better understand advanced nutrient removal from municipal secondary effluent. Factors influencing microalgae-based nutrient removal were divided into intrinsic, environmental, and operational categories; several factors were identified in each category, and their influences on microalgal nutrient removal were discussed. A multiplicative kinetic model was integrated to estimate microalgal growth-related nutrient removal based majorly on environmental and intrinsic factors. Limitations and prospects of future full-scale microalgae-based advanced municipal wastewater treatment were also suggested. The manuscript could offer much valuable information for future studies on microalgae-based advanced wastewater treatment and water reuse.

Keywords: Advanced municipal wastewater treatment; Influencing factors; Kinetics; Microalgae; Nutrient removal; Water reuse.

Related information

PubChem Compound (MeSH Keyword)

LinkOut - more resources

Full Text Sources

Springer

Other Literature Sources

scite Smart Citations