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► Urban wastewater treatment by microalgae

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Research Article

Urban wastewater treatment by microalgae, bacteria and microalgae–bacteria system (Laboratory-scale study)

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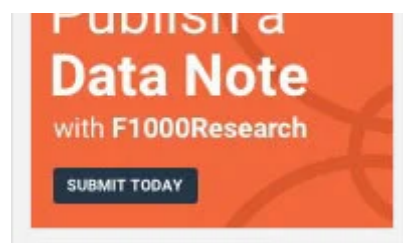
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ABSTRACT

Besides existing methods of urban wastewater treatment processing (WWTP), microalgae culture systems are one of the environmental friendly methods for improving urban wastewater treatment. In this research, the removal efficiency of N-nitrate and orthophosphate from urban wastewater were investigated using free and immobilized *Chlorella vulgaris* microalgae, *Pseudomonas fluorescens* bacteria and symbiosis of microalgae with bacteria. *Pseudomonas fluorescens* bacteria are a group of bacteria that stimulates plant growth. The performance of immobilized microalgae and immobilized bacteria in nitrate removal was better than that in free microalgae and free bacteria. The results showed that the maximum removal efficiency of N-NO₃ was 87.06% in immobilized microalgae (MIM). In removing orthophosphate, free microalgae-bacteria (MBFr) and immobilized microalgae–bacteria (MBIm) had higher performance among other treatments with removal efficiency of 89.64% and 86.38%, respectively. According to significant reductions of orthophosphate on the second day of measurements, the residence time could be considered about two days.

Q KEYWORDS: Bacteria immobilizing microalgae symbiosis wastewater

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Highlights

1. In treatments containing microalgae and bacteria, a competition was created between microalgae and bacteria which reduced the performance of nitrate removal efficiency in comparison with microalgae treatments.
2. The immobilization increased the nitrate removal efficiency from wastewater and improved the biomass collection from the treated wastewater.
3. The removal efficiency of orthophosphate in free microalgae bacteria was higher than that in immobilized microalgae bacteria.
4. In general, the optimum treatment was immobilized microalgae (MIm) treatment. The removal efficiency of N-NO_3^- and orthophosphate was 87.1% and 84.2%, respectively.
5. The results showed that the significant reductions of orthophosphate concentration were occurred on the second day of measurement. In MBlm 10,752, Blm 10,752 and MFr treatments, the orthophosphate removal efficiencies were 87.2%, 87.2% and 86.0%, respectively. Therefore, the optimal residence time could be considering as two days



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