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Rapid granulation and stable performance of a microalgal-bacterial granular sludge system treating saline wastewater

Marta Alves [1], Ana T. Oliveira [1], Paula M.L. Castro [1], Catarina L. Amorim [1]

(1) Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal

Microalgal-bacterial based processes represent competitive alternatives for wastewater treatment. Co-cultivation of microalgae and bacteria promotes mutual growth and enhances nutrients removal from wastewater, representing a viable alternative to conventional treatment processes. The microalgae poor settleability is the major challenge of such systems, hindering their application.

This study aimed to develop a microalgal-bacterial granular sludge able to treat saline wastewater. For that, a lab-scale photo sequencing batch reactor was inoculated with activated sludge, previously adapted to high salinity, and a microalgae consortium enriched from water collected at a marine aquaculture. The aggregation of microalgal and bacterial biomass occurred rapidly. Microscopic observation revealed that at first, a mixture of yellowish and green granules was present but throughout operation, dark green granules with a dense and compact structure became predominant. The reactor exhibited excellent and stable organic carbon and ammonium removal performance, about 99 and 94%, with nitrate as the major N species in the reactor effluent. This study reinforced the robustness of microalgae-bacterial granules to treat saline wastewater, supporting their potential implementation at full-scale.

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