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Microalgae Bacteria Granules, an Alternative Technology to the Conventional Wastewater Treatment: Structural and Metabolic Characterization

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Abstract : The population and economic growth have generated a significant new number of pollutant compounds which have to be degraded before reaching the environment. The wastewater treatment plants (WWTPs) have been the last barrier between the domestic and/or industrial wastewaters and the environment. At present, the conventional WWTPs have very high operational costs, most of them linked to the aeration process (60-65% from total energy costs related to wastewater treatment). In addition, they have had a low efficiency in pollutants removal such as pharmaceutical and other resilient anthropogenic compounds. In our study, we have been focused on new wastewater treatment strategies to enhance the efficiency of pollutants removal and decrease the wastewater treatment operational costs. The usage of mixed microalgae-bacteria granules technology generated high efficiency and low costs by a better harvesting and less expensive aeration. The intertrophic relationships between microalgae and bacteria have been characterized by the structure of the population community to their metabolic relationships. The results, obtained by microscopic studies, showed well-organized and stratified microalgae-bacteria granules where bacteria have been enveloped in the microalgal structures. Moreover, their population community structure has been modulated as well as their nitrification, denitrification processes (analysis based on qPCR genes expression) by the type of the pollutant compounds and amounts. In conclusion, the understanding and modulation of intertrophic relationships between microalgae and bacteria could be an economical and technological viable alternative to the conventional wastewater treatment. Acknowledgements: This research was supported by grant PN-III-P4-ID-PCE-2016-0865 from the Romanian National Authority for Scientific Research and Innovation CNCS/CCCDI-UEFISCDI.
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