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Microalgae-mediated bioremediation and valorization of cattle wastewater previously digested in a hybrid anaerobic reactor using a photobioreactor: Comparison between batch and continuous operation

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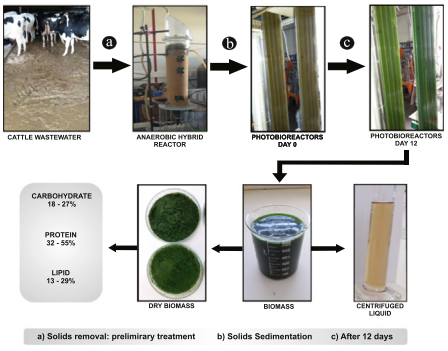
HIGHLIGHTS

- Cultivation of microalgae *Scenedesmus obliquus* with anaerobic cattle wastewater was investigated.
- Maximum CODs removal in Batch was 70% and continuous 61%.
- Removals above 96% (NH_4^+) and 70% (PO_4^{-3}) were recorded.
- Better biomass productivity (358 mg L^{-1} d^{-1}) was obtained in batch.
- Productivity values for proteins, carbohydrates and lipids of 150, 110 and 64 mg L^{-1} d^{-1} were achieved.

GRAPHICAL ABSTRACT



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ABSTRACT

Scenedesmus obliquus (ACOI 204/07) microalgae were cultivated in cattle wastewater in vertical alveolar flat panel photobioreactors, operated in batch and continuous mode, after previous digestion in a hybrid anaerobic reactor. In batch operation, removal efficiencies ranges of 65 to 70% of COD, 98 to 99% of NH_4^+ and 69 to 77.5% of PO_4^{-3} after 12 days were recorded. The corresponding figures for continuous flow were from 57 to 61% of COD, 94 to 96% of NH_4^+ and 65 to 70% of PO_4^{-3} with mean hidraulic retention time of 12 days. Higher rates of CO_2 fixation (327–547 mg L^{-1} d^{-1}) and higher biomass volumetric productivity (213–358 mg L^{-1} d^{-1}) were obtained in batch mode. This microalgae-mediated process can be considered promising for bioremediation and valorization of effluents produced by cattle breeding yielding a protein-rich microalgal biomass that could be eventually used as cattle feed.

1. Introduction

Cultivation of microalgae to produce energy is considered a promising renewable alternative to replace the use of fossil fuels (Markou et al.,

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