Giovanni Antonio Lutzu et al., J Fundam Renewable Energy Appl 2017, 7:7 (Suppl)
DOI: 10.4172/2090-4541-C1-038

Feasibility of using brewery wastewater for biodiesel production and nutrient removal by *Scenedesmus dimorphus*

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A new type of wastewater, which has potentially been recognized as an appreciable source of nutrients for microalgae cultivation, is represented by the brewery wastewater produced by the brewing industry. This work investigates the potential use of this effluent as a medium for the cultivation of the oleaginous species *Scenedesmus dimorphus* with the double aim of removing nutrients and to produce biomass as feedstock for biodiesel. For this purpose, effects of nitrogen (61.8-247 mg L^{-1}), phosphorous (1.4-5.5 mg L^{-1}) and iron (1.5-6 mg L^{-1}) concentrations on growth, nutrients uptake, lipid accumulation and fatty acids profile of this microalga were investigated. Results showed that brewery wastewater can be used as a culture medium even if nitrogen and phosphorous concentrations should have been modified to improve both biomass (6.82 g L^{-1}) and lipid accumulation (44.26%). The analysis revealed a C16-C18 composition of 93.47% fatty acids methyl esters with a relative high portion of unsaturated ones (67.24%). High removal efficiency (>99%) for total nitrogen and total phosphorous and a reduction of up to 65% in chemical oxygen demand was achieved, respectively. The final microalgae biomass, considering its high lipid content as well as its compliance with the standards for the quality of biodiesel and considering also the high removal efficiencies obtained for macronutrients and organic carbon makes the brewery wastewater a viable option as a priceless medium for the cultivation of microalgae.

Biography

Giovanni Antonio Lutzu is an Environmental Biologist, has strong interest on the use of microalgae for environmental remediation and as a priceless source of biofuels and high-value added products. He has obtained his PhD at University of Cagliari, Italy, investigating the growth kinetics of microalgae in batch and semi-batch photo-bioreactors. Later, during his Postdoctoral Fellowship at the QIBEBT, China, he has focused his attention to the extraction of lipids relevant to the production of microalgal biofuels and to the enhancement of biomass as feedstock for high-value natural products. His ultimate goal as a Scientist has been to explore the feasibility of using wastewaters as a culture medium to enhance lipid and bioproducts accumulation in microalgae. Presently, he is carrying out research at BAE-OSU on the feasibility of using isolated Oklahoma native microalgae strains for the treatment of wastewater generated during the fracking activity for the extraction of oil and gas.

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