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Abstract

Treatment of Dairy Wastewaters Using *Nannochloris* sp. Microalgae Strain †

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The dairy industry is one of the main sources of agro-industrial wastewater. The wastewater produced from this industry mainly consists of milk and milk products residues, byproducts of the processing operations, water used for the cleaning of the equipment, and sanitary wastewater from the staff. In general, the two main types of wastewaters produced in the dairy industry are: (a) high-strength wastewater (e.g., cheese whey, milk permeate) and (b) medium-strength dairy effluent (e.g., effluents from the production of yoghurt, butter ice-creams, cheese final wastewater effluents) [1].

The aim of the paper is to study the potential of microalgae to reduce the content of organic compounds from a residual stream in the dairy industry (and, more specifically, the reduction of N, P and COD), as well as the effects of microalgae growth by monitoring growth curves and biomass productivity in the cheese whey environment after seven days of growth.

The growth medium chosen for the cultivation of microalgae was deproteinized cheese whey. The microalgae strain chosen for these experiments is *Nannochloris* sp. The growth medium (specific Zarrouk) was prepared through the addition of the respective salts that comprise the Z medium in deproteinized cheese whey (which was used as a carbon source). The experiments were performed with samples of increasing concentrations of cheese whey, calculated as the amount of lactose (0, 2.5, 5, 7.5, 10 g/L) (Figure 1). Whey dosing was carried out based on spectrophotometric determination of lactose.

Figure 1. Cultivation of *Nannochloris* sp. microalgae strain on dairy wastewaters—samples of increasing concentrations of lactose (0, 2.5, 5, 7.5, 10 g/L).

Cultivation of the microalgae strain *Nannochloris* sp. on dairy wastewater (i.e., cheese whey) resulted in an increase in biomass productivity proportional to the concentration

of lactose present. Also, following the analysis of the growth medium at the end of the experiment, an almost complete consumption of lactose by microalgae was obtained, with small quantities being found in the samples of higher concentrations at the end of the cultivation process.

Preliminary results have shown the great potential of microalgae, specifically *Nannochloris* sp., for water reclamation from dairy industry derived wastewater. A significant reduction in P, N, chemical oxygen demand and lactose of up to 82%, 94%, 94% and 99%, respectively was achieved. Biomass productivities increased directly proportional to lactose concentration, while the distribution of bioactive compounds in microalgae biomass remained similar for all cases.

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