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03-05 DECEMBER 2019 | PARIS

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Optimization of fucoxanthin production of fucoxanthin production by *Phaeodactylum tricornutum* in continuous photobioreactors

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Abstract:
Microalgae are receiving increasing attention as potential sources of high-value compounds. In particular fucoxanthin, a carotenoid pigment produced by some microalgae and diatoms has been shown to exhibit a range of promising health benefits [1]. Fucoxanthin content is influenced by several variables, firstly light. A few works aimed at evaluating the effect of culture conditions on fucoxanthin production have been carried out [2-4]. Experiments conducted in batch, regime commonly adopted to evaluate microalgae growth performances, are limited by preinoculum acclimation and biomass concentration changing over time, which makes it difficult to quantify the effect of operating variables. In a continuous system operated at steady-state, biomass production is constant as cells are well acclimated to environmental conditions [5-7]. This allows to better describe growth kinetics and physiology of the microorganism with a quantitative approach. At steady-state, the biomass composition is also stable, which is particularly interesting in view of the potential commercialization of specific products (e.g. pigments). In this work, the effectiveness of cultivation of *Phaeodactylum tricornutum* in a continuous system for fucoxanthin production is presented, investigating the effects of light intensity and residence time. Two irradiances (PPFD) (70 and 120 µmol photons m^{-2} s^{-1}) were tested at several residence times, showing a good stability of biomass production at steady-state, as well as a strong sensitivity of the species to the light perceived. Biomass yield and specific content of fucoxanthin were measured, with the aim of determining the operating conditions that maximize its production.

Keywords:
Phaeodactylum tricornutum; pigments; high-value bioproducts; continuous cultivation

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