MULTIVARIABLE APPROACH ON GROWTH OF MICROALGAE

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Body

Despite the increasing interest in microalgal biomass and its high-value compounds, the number of products that successfully reach the market is still neglectable when compared to the high potential linked to these organisms. High production costs and low productivity – both in terms of biomass and metabolites – associated with microalgae growth are some of the causes hindering their widespread use and commercialization. The use of high-density cell cultures, for instance, is a strategy that arises as a potential solution to overcome these challenges. However, the optimization of growth parameters individually, may not be suitable since it does not take into account the interactions and synergies between different variables.

This work aims at optimizing the culture conditions of a heterotrophic Chlorella vulgaris sp. in order to enhance both biomass concentration. For that purpose, a multivariable approach was developed envisaging the optimization of 24 independent variables simultaneously through Design of Experiment tools using the Protimiza Experimental Design software. The composition (i.e., concentration of 20 macro- and micronutrients, including the organic carbon source) and pH of the culture medium, starting inoculum, agitation, and temperature were the parameters studied.

The variation of culture conditions allowed obtaining significant differences on growth kinetics. Biomass concentration ranged between 0.2 and 18.7 $g.L^{-1}$, while biomass productivity presented a 52-fold variation when considering its minimum and maximum values. Besides the impact of different conditions on C. vulgaris growth, these trials also enabled to determine which variables played a statistically significant role on both biomass concentration and productivity, with a confidence level of 95 %. The concentration of the sources of nitrogen, organic carbon and magnesium have shown a significant impact over biomass concentration, being the source of nitrogen the most relevant parameter. On the other hand, the concentration of the sources of nitrogen and magnesium, as well as the pH of the culture medium, proved to be determinant to biomass productivity. However, in this case, the pH was found to have the dominant effect.**Acknowledgements**
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Palavras-chave : Growth optimization, Chlorella vulgaris, DOE tools, Significant variables, Biomass production