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Combined effect of light intensity and CO_2 concentration on *Microcystis aeruginosa* growth

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Worldwide occurrence of hepatotoxic cyanobacterium *Microcystis aeruginosa* and the accumulation of its toxin (microcystin), have been responsible for several human deaths and animal intoxication incidents. In recognition to its toxicity, the WHO and national governments established recommendation values for this toxin in water, which gave rise to an increasing demand for microcystin's analytical standards. These standards might be used either as laboratory standards in human and environmental risk assessment or as tools for molecular and cell biology studies. However, their availability is limited due to constraints found in production and purification processes, which inflate the final price to values as high as 28000€/mg. Thus, the optimization of this cyanobacterium cultivation and toxin purification techniques is needed to decrease production cost of such high added-value product. Despite numerous studies reporting the influence of environmental factors over cyanobacterial growth and toxicity, not much is known about the impact of synergies generated between those parameters in *Microcystis* cultivation. The aim of this work is therefore to assess the combined effect of light intensity and CO_2 concentration on *M. aeruginosa* growth and toxin productivity. For that purpose, different light intensities were tested (10-145 $\mu mol.m^{-2}.s^{-1}$) jointly with several CO_2-enriched air streams (0-7.5 %(v/v)). The influence of these variables on maximum biomass concentration (X_{max}, $g.L^{-1}$) and productivity (P_{max}, $g.L^{-1}.d^{-1}$) was evaluated through a factorial design. According to results obtained, optimum light intensity - reflected on maximum biomass concentration or productivity achieved - is highly dependent on CO_2 concentration and vice-versa, showing a bell-shaped curve behavior (e.g. optimal point reached at intermediate conditions). The highest X_{max} and P_{max} were observed at 55 $\mu mol.m^{-2}.s^{-1}$ and 2.5 %(v/v) CO_2 (≈1.95 $g.L^{-1}$), and at 145 $\mu mol.m^{-2}.s^{-1}$ and 5 %(v/v) (≈0.17 $g.L^{-1}.d^{-1}$) CO_2, respectively. These results thus point at the possibility of increasing microcystin productivity through adequate regulation of cultivation parameters.

Palavras-Chave/Palabras Clave: *M. aeruginosa*; CO_2; Light intensity; Productivity; Synergies

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