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Combined effect of environmental factors on *Microcystis aeruginosa* growth and toxin productivity

Pedro Geada[1], Ricardo Pereira[1], Vitor Vasconcelos[2], António Augusto Vicente[1], Bruno Fernandes[1]

[1]Universidade do Minho, Portugal
[2]Universidade do Porto, Portugal

e-mail: pedrogeada@ceb.uminho.pt

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 these parameters. Taking advantage of such unexplored perspective, the aim of this work is to assess the combined effect of light intensity, CO_2 concentration, temperature, and medium pH on *Microcystis aeruginosa* growth and toxin productivity. The combined influence of these variables on maximum biomass concentration (X_{max}, $g.L^{-1}$), biomass productivity (P_{max}, g of *M. aeruginosa* per L per day), and specific growth rate (μ_{max}, h^{-1}) was evaluated through a factorial design. In a first phase, different light intensities (10 - 190 $\mu mol.m^{-2}.s^{-1}$) and CO_2 concentrations (0 - 10 % (v/v)) were tested. Then, at the optimal conditions found for maximum biomass productivity with those two variables, assays were performed at different temperatures (15 - 40 ˚C) and pH values (6.5 - 9.5) resulting in X_{max}, P_{max} and μ_{max} values between 0 - 2.041 $g.L^{-1}$, 0 - 0.262 $g.L^{-1}.d^{-1}$ and, 0 - 0.0457 h^{-1}, respectively. The results show that optimal conditions for *M. aeruginosa* dissemination are obtained at 155 $\mu mol.m^{-2}.s^{-1}$ and pH 8.7 using a CO_2-rich atmosphere (i.e. 5.5 % (v/v)) at 34 ˚C. All the abiotic factors tested showed to have a statistically significant effect on $P_{max}$and μ_{max} at a 95 % confidence level. The exception was pH which did not present a statistically significant effect on μ_{max}. This work has set the bases to explore combinations of environmental variables as a means of limiting cell growth and/or toxin production.

ICHA

The 17th International Conference on Harmful Algae Brazil 2016

Abstract Book

09-14 October

Florianópolis

Santa Catarina | Brazil