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Evaluation of two strains of Portuguese marine cyanobacteria in natural seawater: biological response and chemical speciation of the culture medium

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Cyanobacteria are an important fraction of aquatic phytoplankton that occur in most open lakes, reservoirs and marine waters. They are responsible for the incidence of blooms in water bodies, which may have harmful effects on human health, and also for other organisms present in the environment (1). Even with an increasing number of reports about the aesthetic, biological, chemical and health impacts caused by these organisms in fresh water (2-4), few studies are focused on the chemical speciation of cyanobacteria cultures. Furthermore, information regarding to marine cyanobacteria and seawater is scarce.

Nowadays, major challenges in trace metal research include determining the proportion of the detectable metal that is actually bioavailable and identifying the organic chelators that help to modify free metal concentrations in natural waters (5). The toxicity of heavy metals released into the environment has increased the attention given to chemical speciation studies in which phytoplankton community has central importance due to its influence in the fate of trace metals in natural waters not only by biological surface reactions, but also by metal uptake and production of extracellular organic matter with metal binding properties (6).

In this sense, the main purpose of this study was to evaluate the biological response of two strains of cyanobacteria collected from the Portuguese coastal border when in natural seawater in vitro. The chemical speciation of the culture medium was determined in order to verify possible modifications in the culture medium as a function of the growth, by the determination of the concentrations of total dissolved trace metals ($[M]_d$), metals into the cyanobacteria cells ($[M]_{cyano}$) and released Cu-complexing ligands, by voltammetric methods. Experiments were followed for 30 days, where control culture medium (without algae) were also carried out in parallel. Results showed, for the first time, that the *Synecocystis sp*. cyanobacterium could grow in natural seawater only enriched with N and P, while the *Oscillatoria sp*. demanded some small amounts of vitamins in the culture medium. It was also observed that *Synecocystis sp.* cyanobacterium released into the medium relatively high quantities of Fe and Zn, which concentrations reached values which can be toxic for other marine microalgae, as previously stated (7). The amount of released metals was compatible with the metal concentration in the cells (at least for Zn).

Results obtained in a laboratory scale regarding to the chemical speciation might be relevant in the establishment of possible causes of marine cyanobacterial blooms, once the availability and function of certain trace metals, combined with other environmental and physical factors, may hold the key to identifying what role these parameters play in cyanobacterial growth and ecology and would provide an understanding in how to control such blooms.

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