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Abstract

Cyanobacteria as a Source of New Antifouling Sustainable Solutions †

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Abstract: The usage of paints and coatings with toxic components for the mitigation of marine biofouling in submerged surfaces continues to cause economic, environmental and human health-related problems worldwide. Natural products have the potential to provide solutions for antifouling applications that are effective and ecologically compatible. The diversity of the secondary metabolites that are produced by cyanobacteria make these organisms a promising source of bioactive compounds, especially when antifouling activity has already been documented. The purpose of this study was to explore the metabolic diversity of a range of cyanobacterial strains from the Blue Biotechnology and Ecotoxicology Culture Collection (LEGE-CC) in search of eco-friendly bioactive compounds for antifouling purposes. A library of fractions, derived from methanolic extracts, belonging to different cyanobacterial strains, was tested towards a prominent macrofouling organism settlement (*Mytilus galloprovincialis* larvae). Promising fractions were submitted to a bioassay guided sub-fractioning that led to the isolation of two compounds. Their structure elucidation was determined by 1D and 2D nuclear magnetic resonance and by mass spectrometry. Anti-settlement effectiveness was assessed through an EC50 bioassay with mussel larvae, as well as antifouling bioactivity towards the growth of five marine biofilm-forming bacteria. The results showed bioactivity against the mussel larvae settlement and low toxicity, but no bacterial growth inhibition was found for the nucleosides (<10% of inhibition). Moreover, general ecotoxicity to the marine environment was evaluated, and the compounds also presented no toxicity against *Artemia salina*, proving them to be ecologically compatible. These promising results confirm the inherent potential of cyanobacteria to provide more sustainable antifouling ingredients to be incorporated in marine coatings.

Keywords: cyanobacteria; antifouling; marine biotechnology; bioactive metabolites

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