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DEVELOPMENT OF A BIOLUMINESCENT CYANOBACTERIAL REPORTER STRAIN FOR DETECTION OF ARSENITE, ARSENATE AND ANTIMONITE

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Abstract

In the present study the potential of a gene fusion between the *arsB* promoter from *Synechocystis* 6803 and the bacterial *luxAB* genes was evaluated to be used as a cyanobacterial bioreporter for monitoring the bioavailability of inorganic arsenic species. A whole-cell bioreporter strain, designated *arsLux,* was constructed based on this fusion. In concert with the specificity of the promoter presented earlier, luminescent signal could be detected upon exposure to arsenite, arsenate and antimonite, in a concentration-dependent manner, following an incubation period of 14 hours. The detection range of *arsLux* was 4 μM to 1 mM for As(III) and Sb(III), and 150 μM to 150 mM for As(V). However, *arsLux* activity was inhibited by Cu^{2+} and Zn^{2+} with a half maximal inhibitory concentration (IC_{50}) of about 8 μM and 16 μM, respectively. The bioreporter performance was tested using water samples from a thermal spring and from the River Tisza, both of them supplemented with arsenite. In the first case the bioluminescent signal was comparable with the signal of the standard solution, whereas in the second case the signal was much lower, presumably due to inhibitors present in the river water. Our data show the *arsB* promoter has the potential for whole cell bioreporter applications with some further improvements that are also discussed.

Keywords: antimony, arsenic, bioluminescent bioreporter, cyanobacteria, *Synechocystis* PCC 6803

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