

Abstract

Massive growth of cyanobacteria, known as 'algal blooms', has become a major concern for water monitoring. It has been observed that environmental factors like temperature, light, and certain patterns of availability of nutrients such as P, N, Fe influence cyanobacterial proliferation and toxin production. In order to monitor nutrients in aquatic ecosystems, an assay for monitoring phosphorus bioavailability to cyanobacteria was developed. The test consists of an immobilized luminescent reporter strain of *Synechococcus* PCC 7942, designated APL. The reporter strain harbours the gene coding the reporter protein luciferase from *Vibrio harveyi* under control of the inducible alkaline phosphatase promoter from *Synechococcus* PCC 7942, and can be induced under phosphorus limitation. The resultant CyanoSensor detects PO_4^{3-}P in a concentration range of 0.3–8 μM after a sample incubation time of 8 h under continuous illumination (50 $\mu\text{E m}^{-2} \text{s}^{-1}$). The sensor also responded to a variety of organic phosphorus sources and was storable for 3 weeks at 4 °C. It could be demonstrated that the CyanoSensor for bioavailability monitoring is an improvement to conventional phosphorus detection methods.