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Baeyer-Villiger monooxygenases from photosynthetic organisms support the production of a multifunctional drug in the cyanobacterium Synechocystis sp. 6803

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PURPOSE OF THE ABSTRACT
The cyanobacterium Synechocystis is progressively attracting interest as cell factory for the production of commodity chemicals, fuels and value-added products by essentially consuming carbon dioxide and water, and using light as energy source [1]. It is currently tested in whole-cell biocatalysis by genetic manipulation of its enzymatic content [2]. It is particularly suitable for expressing enzymes candidates for reduction reactions requiring NADPH, being unusually rich in this cofactor that is actively regenerated through photosynthesis [3].
We have produced two Synechocystis strains constitutively expressing two Baeyer-Villiger monooxygenases from eukaryotic photosynthetic organisms that we had described some time ago: CmBVMO and PpBVMO, respectively from the red alga Cyanidioschyzon merolae and the moss Physcomitrella patens [4]. We have examined the two strains in toxicity tests on Petri dishes, by furnishing some molecules that had been identified as preferred substrates upon biocatalytic profiling. Such tests have permitted (i) to verify the permeability of the outer and cytoplasmic cellular membranes to a given molecule, (ii) to evaluate its (approximate) minimal toxic concentration in Synechocystis wild-type cells and (iii) to observe the in vivo activity of the recombinant enzyme, if any, acting on it. After focusing our attention on a substituted aryl chetone that is a natural molecule used as dietary supplement, we moved to biotransformations. By furnishing the molecule to the CmBVMO-expressing strain, we could reveal by HPLC analysis the progressive disappearance of the substrate and the appearance of the expected product (a multifunctional drug) in the growth medium. We will report on this study and its envisaged progresses.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

BVMO | Synechocystis | whole-cell biotransformation

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