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Comparison of ethanol tolerance between potential cyanobacterial production hosts

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Highlights

- Nine cyanobacterial strains and substrains were compared for ethanol tolerance
- The study revealed significant strain-specific differences in sensitivity to ethanol
- *Synechococcus* sp. PCC 7002 displayed the highest tolerance towards ethanol
- Clear deviation between *Synechocystis* sp. PCC 6803 laboratory strains was observed
- Phenotypic variation complicates direct quantitative comparison between strains

Abstract

Cyanobacteria are photosynthetic prokaryotes that have been extensively studied as potential autotrophic biotechnological hosts for the production of different carbon-based end-products directly from atmospheric CO₂. While commercially competitive applications do not yet exist, the production of ethanol in cyanobacteria is the most mature technology, endorsed by relatively high production yields and established status of ethanol in the global biofuel market. Within this concept, the aim here was to systematically compare ethanol tolerance of different commonly used cyanobacterial strains and substrains, in order to assess their relative potential for biotechnological production platforms. The comparison revealed clear strain-specific differences in ethanol toxicity, with growth inhibition GI₅₀ values ranging between 3 gL⁻¹ (0.4% V/V) and 28 gL⁻¹ (3.5% V/V). The most tolerant wild-type strains were *Synechocystis* sp. PCC 6803 (substrain A) and *Synechococcus* sp. PCC 7002, which did not show any apparent effect in growth below ethanol concentrations 9.2 gL⁻¹ (1.2% V/V). In comparison to typical biotechnological yeast strains used for ethanol fermentation, these values are clearly lower but still around the same order of magnitude. The results also underlined the challenges in direct number-

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