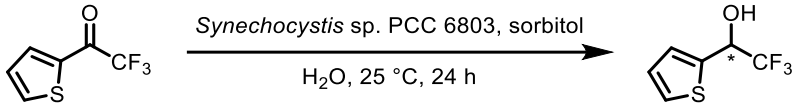
The effect of sorbitol addition on the asymmetric reduction of ketones using cyanobacterium *Synechocystis* sp. PCC 6803

([1]*Department of Chemistry, Graduate School of Science, Osaka Metropolitan University,* [2]*Department of Biological Chemistry, Graduate School of Science, Osaka Metropolitan University,* [3]*Faculty of Pharmaceutical Sciences, Himeji Dokkyo University*)
○Satsuki Fukui[1], Hideo Kojima[1], Satomi Takeda[2], Rio Yamanaka[3]
Keywords: Cyanobacterium; Asymmetric Reduction; Ketones; Sorbitol Addition

Optically active alcohols are crucial as versatile chiral intermediates in the pharmaceutical and agrochemical industries. Utilizing whole-cell biotransformation through the asymmetric reduction of prochiral ketones represents a potent approach for generating such optically active alcohols. This method is particularly advantageous due to the availability and recycling of reducing cofactors (e.g., NAD(P)H) within the cells. Despite these advantages, the challenge of achieving high yields persists in whole-cell biotransformation processes. In a previous study, we reported on the effect of incorporating organic solvent additives in the asymmetric reduction of β-keto esters, employing the cyanobacterium *Synechocystis* sp. PCC 6803.[1] Building on this, our current investigation explores the potential of sorbitol addition to enhance the yield of asymmetric ketone reduction using *Synechocystis* sp. PCC 6803.

The wild-type strain of *Synechocystis* sp. PCC 6803 was cultivated in BG-11 medium and exposed to fluorescent light (20 μmol m^{-2} s^{-1}) at 25 °C for 10 days. The asymmetric reduction of ketone **1** (0.05 mg/mL) to chiral alcohol **2** was performed using the cyanobacterial strain ($Abs_{680\text{-}750}$ 0.33). This reaction took place in the presence of sorbitol (0.5 M) under either red LED light illumination (660 nm, 10 μmol m^{-2} s^{-1}) or in darkness at 25 °C for 24 hours (Scheme 1). Yields and enantiomeric excess (ee) were quantified using gas chromatography. Notably, the addition of sorbitol resulted in an increased yield of **2** under dark conditions, as detailed in Table 1.



1 **Scheme 1** **2**

Table 1.

Light cond.	Sorbitol (M)	**2**/%	**2**/%ee (config.)
light	none	34	33 (*S*)
dark	none	10	25 (*S*)
light	0.5	30	33 (*S*)
dark	0.5	35	24 (*S*)

1) S. Tanaka, H. Kojima, S. Takeda, R. Yamanaka, T. Takemura, *Tetrahedron Lett.*, **2021**, *77*, 153249

