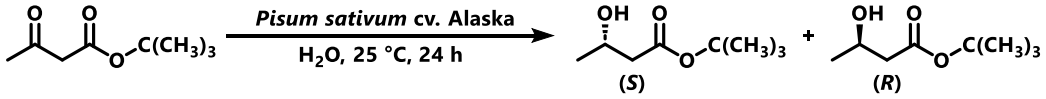
Asymmetric Reduction of Ketones Using *Pisum sativum* as A Whole-cell Biocatalyst

([1]*School of Science, Osaka Prefecture University*, [2]*Graduate School of Science, Osaka Metropolitan University*) ○Kyoka Matsuhara,[1] Ryota Shimamoto,[2] Yuya Machi,[2] Hideo Kojima,[2] Satomi Takeda[2]

Keywords：*Pisum sativum*; Asymmetric Reduction; Ketones; Whole-cell Biocatalyst

Pea (*Pisum sativum*) is widely cultivated because it is easy to grow and inexpensive. Polyphenols obtained from peas by extraction have a wide range of pharmacological activities and have been applied to nutraceuticals, however, there are few examples of their use as biocatalysts for material transformations. In this study, we investigated the effects of light on the growth and reaction stages in the asymmetric reduction of ketones using *Pisum sativum* as a whole-cell biocatalyst for the preparation of optically active alcohols used as chiral building blocks in the synthesis of pharmaceuticals and agrochemicals.

Pisum sativum cv. Alaska was grown under the illumination of fluorescent light (100 μmol m^{-2} s^{-1}) (L) or in the dark (D) at 25 °C for 14 days. The seedlings, sterilized in 0.5% sodium hypochlorite solution, were used for the reaction. *tert*-Butyl acetoacetate (^{t}BAA) was used as a substrate. The seedlings (200 mg) were added to the respective aqueous solutions (5 mL) containing the ketone (5 μmol) and allowed to react under the illumination of light (L) (100 μmol m^{-2} s^{-1}) or in the dark (D) for 24 h at 25 °C (Scheme 1). The yields and enantiomeric excess (*ee*) were determined by gas chromatography (Table 1). We found that the corresponding *S*-alcohol was produced exclusively under both light and dark reaction conditions. The yields were higher for seedlings grown under light.



Scheme 1

Table 1.

Growth cond.	Reaction cond.	Yield (%) [a]	*ee* (%) [a]
L	L	88	>99 (*S*)
L	D	66	>99 (*S*)
D	L	55	>99 (*S*)
D	D	46	>99 (*S*)

[a]Determined using GC. All values represent the mean of three experimental results.

© The Chemical Society of Japan