Asymmetric reduction of keto esters using *Pisum sativum* as a whole-cell biocatalyst

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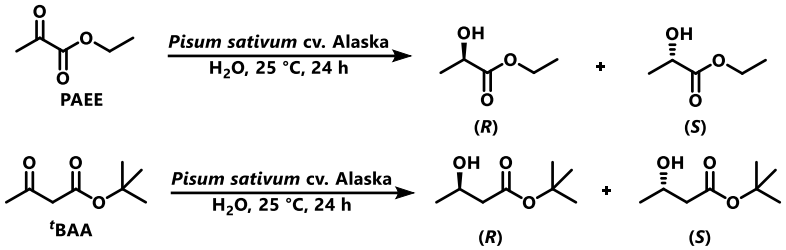
Keywords: *Pisum sativum*, Asymmetric Reduction, Keto Esters, Whole-cell Biocatalyst

Pea (*Pisum sativum*) is widely cultivated throughout the world 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, but there are few examples of their use as biocatalysts for material transformations. In this study, we investigated the use of *Pisum sativum* as a whole-cell biocatalyst for the preparation of optically active α- or β-hydroxy esters, which are used as chiral building blocks for the synthesis of pharmaceuticals and agrochemicals.

Pisum sativum cv. Alaska was grown under fluorescent light (40 μmol m^{-2} s^{-1}) at 25 °C for 14 days. The seedlings, sterilized in 0.5% sodium hypochlorite solution, were used for the reaction. The seedlings (200 mg) were added to the aqueous solution of α- or β-keto ester (5 mL) and allowed to react under the illumination of light (L) (40 μmol m^{-2} s^{-1}) or in the dark (D) for 24 h at 25 °C (Scheme 1). The product was extracted with ether. Yield and enantiomeric excess (*ee*) were determined by gas chromatography. In all cases, the corresponding alcohols were obtained with good to high ee values. The results are shown in Table 1.



Scheme 1

Table 1. Asymmetric reduction of keto esters using *Pisum sativum* cv. Alaska.

Substrate	Light cond.	Yield (%)[a]	*ee* (%)[a]
PAEE	L	14	88 (*R*)
PAEE	D	20	86 (*R*)
^{t}BAA	L	89	>99 (*S*)
^{t}BAA	D	60	>99 (*S*)

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