Regio- and Stereoselective Fungal Oxyfunctionalisation of Limonenes

Rüdiger Kaspera[a], Ulrich Krings[a], Michael Pescheck[b], Dieter Sell[b], Jens Schrader[b], and Ralf G. Berger[a,*]

[a] Zentrum für Angewandte Chemie der Universität Hannover, Institut für Lebensmittelchemie, Wunstorfer Str. 14, D-30453 Hannover, Germany. Fax: +49-511-762-4547. E-mail: rg.berger@lci.uni-hannover.de
[b] Karl-Winnacker-Institut der DECHEMA e. V., Theodor-Heuss-Allee 25, D-60486 Frankfurt am Main, Germany

[*] Author for correspondence and reprint requests

Z. Naturforsch. **60 c**, 459–466 (2005); received November 23/December 23, 2004

Selective transformations of limonene by asco- and basidiomycetes were investigated. On the shake flask scale, *Penicillium citrinum* hydrated *R*-(+)-limonene to *α*-terpineol [83% regioselectivity (rs), more than 80 mg l^{-1} product yield], and *Gongronella butleri* catalysed the terminal oxidation to yield perillyl alcohol (60% rs, 16 mg l^{-1}). On the laboratory bioreactor scale, *Penicillium digitatum* produced a peak concentration of 506 mg *α*-terpineol l^{-1} in the fed-batch mode, equivalent to a theoretical yield of 67%, and no volatile by-products were found. *Fusarium proliferatum* transformed *R*-(+)-limonene enantiospecifically to *cis*-(+)-carveol (98.6% ee, more than 35 mg l^{-1} product yield) and *S*-(–)-limonene predominantly to *trans*-(–)-carveol (96.3% ee). *Pleurotus sapidus* selectively dehydrogenised the accumulating *trans*-(–)-carveol to the corresponding enantiopure *R*-(–)-carvone. The results show that a careful selection of strain and bioprocess parameters may improve both the yield and the optical purity of a desired product.

Key words: Limonene, Oxyfunctionalisation, Stereoselectivity