Phytochemistry, Vol. 24, No. 6, pp. 1293–1294, 1985.
Printed in Great Britain.

0031–9422/85 $3.00 + 0.00

SESQUITERPENE ALCOHOLS FROM *LENTINUS LEPIDEUS*

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(*Received* 14 *September* 1984)

Key Word Index—*Lentinus lepideus*; Basidiomycetes; volatile metabolites; sesquiterpene alcohols; fungal terpenoids.

Abstract—Several sesquiterpene alcohols, mainly possessing a 4,10-dimethyl-7-isopropyldecaline skeleton (cadinols, muurolols, cubenols), have been identified from synthetic liquid cultures of the brown rot fungus *Lentinus lepideus*. Besides these, *trans,trans*-farnesol and the bicyclofarnesol drimenol have been found.

INTRODUCTION

On complex culture media, the basidiomycete *Lentinus lepideus* FR. produces several volatile cinnamate derivatives formed via the shikimate pathway (for review see ref. [1]). Recently, it could be demonstrated that certain strains accumulate almost exclusively sesquiterpenes under suitable liquid culture conditions [2, 3]. Especially the nitrogen source influenced the formation of volatile metabolites. From the apolar fraction of the steam distillates, mainly compounds with a cadinane skeleton could be identified [4]. In the present communication, the identification of eight sesquiterpene alcohols from the most polar fraction of the steam distillates obtained from cultures of the strain FPRL 7 B after cultivation on a glucose-mineral salt medium containing isoleucine as sole nitrogen source is reported. The major compounds are—in accordance with the hydrocarbon constituents—compounds with a 4,10-dimethyl-7-isopropyldecaline skeleton. Five of these compounds are described for the first time as fungal metabolites.

RESULTS AND DISCUSSION

The brown root fungus *L. lepideus* FPRL 7 B was cultivated on a liquid glucose–isoleucine–mineral salt medium. The steam distillates obtained from 3-month-old cultures mainly consisted of 2-methylbutan-1-ol and sesquiterpenes.

After separation into five fractions of different polarity by dry-CC [5], more than 30 compounds were obtained in the most polar fraction, the great majority being trace components. As major constituents, bicyclic sesquiterpene alcohols of the 4,10-dimethyl-7-isopropyldecaline type (cadinanes and related compounds) could be identified by their GC/MS data and retention time comparison of R_I values.

The predominant compound is (−)-torreyol (= δ-cadinol) **1**, a metabolite that has already been isolated from cultures of *Clitocybe illudens* [6] and a *Stereum* species [7; van Eijk, G. W., personal communication]. Further constituents are the related epimeric alcohols (−)-T-muurolol **2**, (+)-T-cadinol **3**, and (−)-α-cadinol **4** which are described for the first time as fungal metabolites. The structural formulae for these muurolols and cadinols are adopted from [8]; mass spectra data given in [8] are in good accordance with those of the newly identified *L. lepideus* metabolites. Cubenol **5** and epicubenol **6** are related isomeric compounds possessing the hydroxyl group at C-1.

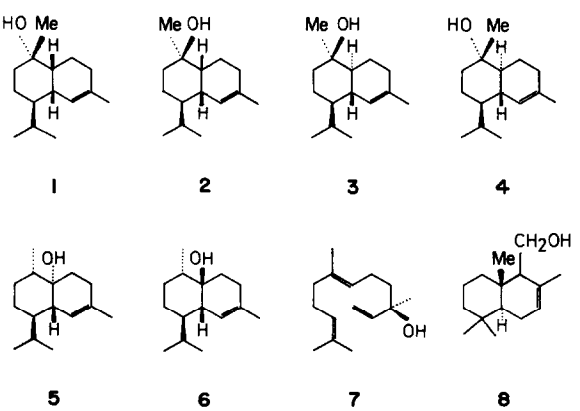
The remaining compounds represent other classes of sesquiterpenes: The acyclic constituent *trans,trans*-farnesol **7** has previously been isolated from cultures of the ascomycete *Ceratocystis coerulescens* [9], whereas the bicyclofarnesol drimenol **8** could be identified from an acetone extract of *Lactarius uvidus* [10].

Using complex culture media or other nitrogen sources (e.g. asparagine, glutamine, ammonium nitrate), volatile sesquiterpenes are accumulated only in traces by this strain. Under the culture conditions described above, the accumulation can be stimulated thousand-fold (mg/l-range), although distinct strain-dependent reactions to different defined culture conditions could be demonstrated [2, 3].

EXPERIMENTAL

Cultivation. L. lepideus FPRL 7 B (Forest Products Research Laboratory, Princes Risborough, U.K.) was cultivated on a defined synthetic liquid medium containing glucose (2%), isoleucine (0.15%), thiamine and mineral salts [11] for 90 days.

Identification of sesquiterpene alcohols. The volatile metabolites were obtained by circulation steam distillation [12] in pentane. The total distillate (2 ml) was separated into five



fractions of different polarity by modified dry-CC [5]. The identification of sesquiterpene alcohols from the most polar fraction V resulted from GC/MS data by comparison with lit. data [8, 13] and those obtained with authentic reference material, and retention time comparison of R_I values. Mass spectra were recorded on a Varian MAT 111 (GNOM) instrument (GC–MS system; 80 eV). A Perkin–Elmer PE F 22 instrument was used for gas chromatography. The GC analyses were performed on a 22 m WG 11 (FFAP) capillary column (WGA; i.d. 0.3 mm).

Acknowledgements—For authentic reference substances and confirmation of our results we thank Dr. K. Bruhn, Dragoco, Holzminden/F.R.G. This work was supported by the Deutsche Forschungsgemeinschaft (DFG).

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