

Phytochemistry Vol. 66, No. 11, 2005

Contents

Special issue

Evolution of Metabolic Diversity

Editors: T. Hartmann, T. M. Kutchan and D. Strack

EDITORIAL

Evolution of metabolic diversity

pp 1198–1199

Thomas Hartmann, Toni M. Kutchan, Dieter Strack

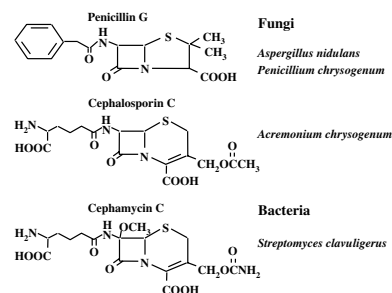
REVIEWS

Evolution of β -lactam biosynthesis genes and recruitment of *trans*-acting factors

pp 1200–1210

Axel A. Brakhage*, Qusai Al-Abdallah, André Tüncher, Petra Spröte

β -Lactam antibiotics are produced by some filamentous fungi, Gram-negative and Gram-positive bacteria. There were arguments in favour of horizontal gene transfer of β -lactam biosynthesis genes from bacteria to fungi. This hypothesis was further supported by the recent identification of *cis-trans*-elements involved in the regulation of the β -lactam biosynthesis genes.

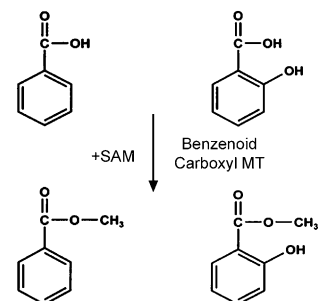


Floral benzenoid carboxyl methyltransferases: From in vitro to in planta function

pp 1211–1230

Uta Effmert, Sandra Saschenbrecker, Jeannine Ross, Florence Negre, Chris M. Fraser, Joseph P. Noel, Natalia Dudareva, Birgit Piechulla*

Methyl salicylate and methyl benzoate are components of many plant aromas and scents. The benzenoid carboxyl methyltransferases catalyze the last step of their synthesis. The MTs are structurally and biochemically characterized, expression properties as well as evolutionary aspects are summarized.



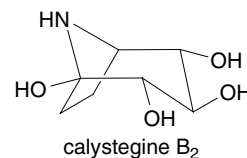
FULL PAPERS

Calystegines in wild and cultivated *Erythroxylum* species

pp 1231–1240

Andrea Brock, Stefan Bieri, Philippe Christen, Birgit Dräger*

Four calystegines were identified in numerous species of the genus *Erythroxylum*, in total up to 0.32% of dry leaf. Occurrence of calystegines together with cocaine, with other alkaloids of a 3 α -hydroxy- or 3 β -hydroxytropene structure, and with nicotine supports the concept of common biosynthetic steps of alkaloids in *Erythroxylum*, similar to those in Solanaceae.



Diversity of non-reducing polyketide synthase genes in the Pertusariales (lichenized Ascomycota): A phylogenetic perspective

pp 1241–1253

Imke Schmitt*, María P. Martín, Stefanie Kautz, H. Thorsten Lumbsch

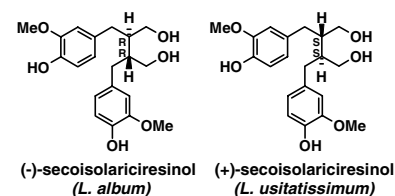
A Bayesian phylogenetic analysis of 157 non-reducing fungal type I PKS gene fragments from lichenized and non-lichenized taxa reveals a high diversity of paralogous genes.

Pinoresinol–lariciresinol reductases with different stereospecificity from *Linum album* and *Linum usitatissimum*

pp 1254–1263

Cosima B.I. von Heimendahl, Katrin M. Schäfer, Patrik Eklund, Rainer Sjöholm, Thomas J. Schmidt, Elisabeth Fuss*

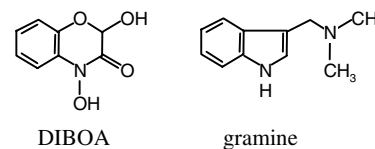
Recombinant pinoresinol–lariciresinol reductases (PLRs) from *Linum album* and *Linum usitatissimum* catalyse opposite enantiospecific conversions from pinoresinol to secoisolariciresinol. Aspects of PLR evolution are discussed.

Evolution of the indole alkaloid biosynthesis in the genus *Hordeum*: Distribution of gramine and DIBOA and isolation of the benzoxazinoid biosynthesis genes from *Hordeum lechleri*

pp 1264–1272

Sebastian Grün, Monika Frey*, Alfons Gierl

Two indole alkaloids with defense related functions are synthesized in the genus *Hordeum* of the Triticeae, gramine (3(dimethyl-amino-methyl)-indole) and the benzoxazinoid 2,4-dihydroxy-2*H*-1,4-benzoxazin-3(4*H*)-one (DIBOA).

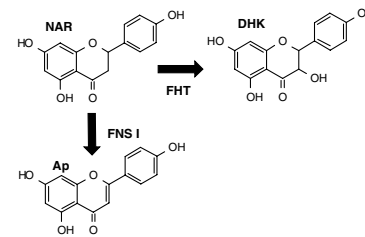


Molecular evolution of flavonoid dioxygenases in the family Apiaceae

pp 1273–1284

Yvonne Gebhardt, Simone Witte, Gert Forkmann, Richard Lukačín, Ulrich Matern, Stefan Martens*

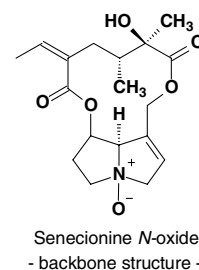
Six 2-oxoglutarate dependent dioxygenases were cloned from Apiaceae species and characterized by heterologous expression in yeast. The sequences encoding flavone synthase I or flavanone 3 β -hydroxylase were subjected to evolutionary analysis, and the evolution of the synthase from the hydroxylase is proposed. The synthase genes of *Petroselinum* and *Daucus* include introns which are lacking from the hydroxylase genes.

**Frequent gain and loss of pyrrolizidine alkaloids in the evolution of *Senecio* section *Jacobaea* (Asteraceae)**

pp 1285–1295

Pieter B. Pelser, Helene de Vos, Claudine Theuring, Till Beuerle, Klaas Vrieling, Thomas Hartmann*

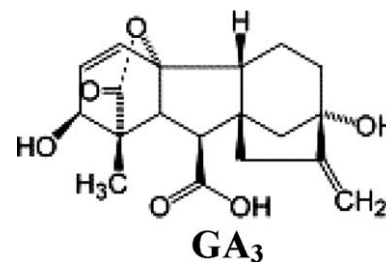
All 24 analyzed species of *Senecio* sect. *Jacobaea* synthesize pyrrolizidine alkaloids (PAs) that are biogenetically derived from senecionine. Optimization of the 26 PAs that were identified in sect. *Jacobaea* on a phylogenetic tree of this species group indicates that 'on/off' changes in the production of individual PAs in the evolutionary history of sect. *Jacobaea* have been remarkably frequent.

**Distribution of gibberellin biosynthetic genes and gibberellin production in the *Gibberella fujikuroi* species complex**

pp 1296–1311

Stefan Malonek, Christiane Bömke, Erich Bornberg-Bauer, María C. Rojas, Peter Hedden, Paul Hopkins, Bettina Tudzynski*

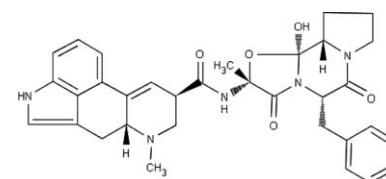
The existence of the gibberellin biosynthetic gene cluster, the expression of the genes and the ability to produce gibberellins were analyzed in several *Fusarium* species of the *Gibberella fujikuroi* species complex.

**The ergot alkaloid gene cluster in *Claviceps purpurea*: Extension of the cluster sequence and intra species evolution**

pp 1312–1320

Thomas Haarmann, Caroline Machado, Yvonne Lübke, Telmo Correia, Christopher L. Schardl, Daniel G. Panaccione, Paul Tudzynski*

The extension of the ergot alkaloid cluster and the comparison of its structure in two chemical races of *Claviceps purpurea* are reported.

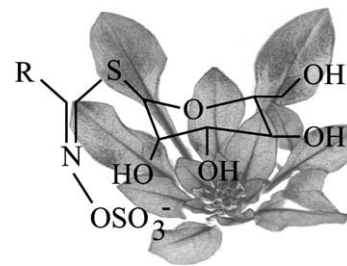


Geographic and evolutionary diversification of glucosinolates among near relatives of *Arabidopsis thaliana* (Brassicaceae)

pp 1321–1333

Aaron J. Windsor, Michael Reichelt, Antje Figuth, Aleš Svatoš, Juergen Kroymann, Daniel J. Kliebenstein, Jonathan Gershenzon, Thomas Mitchell-Olds*

Glucosinolates are defensive, secondary metabolites that display both intra- and interspecific variation in the order Brassicales. As such, glucosinolate physiology has provided an opportunity to study the geographical, organismal, and genetic processes influencing the evolution of plant defenses at a macroevolutionary scale.

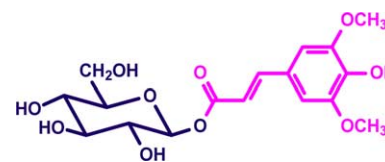


Formation of a complex pattern of sinapate esters in *Brassica napus* seeds, catalyzed by enzymes of a serine carboxypeptidase-like acyltransferase family?

pp 1334–1345

Alfred Baumert, Carsten Milkowski, Jürgen Schmidt, Manfred Nimtz, Victor Wray, Dieter Strack*

Structures of 15 seed constituents of oilseed rape were identified by spectroscopic methods. RNAi-based suppression of a sinapate glucosyltransferase gene (*BnSGT1*) resulted in the disappearance or marked decrease of various sinapate esters indicating that they are synthesized via 1-*O*-sinapoyl- β -glucose assumed to be catalyzed by a SCPL acyltransferase protein family.

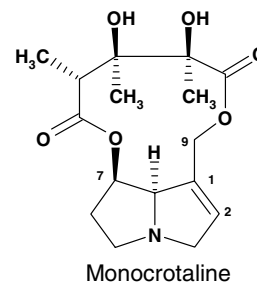


Recruitment of alkaloid-specific homospermidine synthase (HSS) from ubiquitous deoxyhypusine synthase: Does *Crotalaria* possess a functional HSS that still has DHS activity?

pp 1346–1357

Niknik Nurhayati, Dietrich Ober*

Quinolizidine alkaloids are the most prominent group of alkaloids in legumes, with exception of the tribe Crotalariae of which many members are known to be able to produce PAs. To study the evolution of pyrrolizidine alkaloid (PA) biosynthesis as a typical pathway of plant secondary metabolism in this tribe, we have searched for a cDNA coding for homospermidine synthase (HSS), the enzyme catalyzing the first specific step in this biosynthesis.

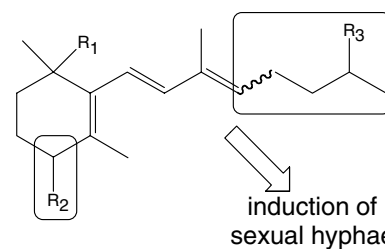


Biological activity of trisporoids and trisporoid analogues in *Mucor mucedo* (–)

pp 1358–1365

Doreen Schachtschabel, Christine Schimek*, Johannes Wöstemeyer, Wilhelm Boland

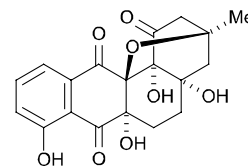
Bioassays with synthetic analogues of early trisporic acid precursors demonstrate their ability to induce zygothecium formation. Structure–activity relationships are discussed.



Gephyromycin, the first bridged angucyclinone, from *Streptomyces griseus* strain NTK 14**pp 1366–1373**

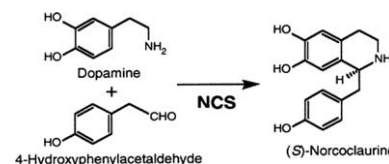
Gerhard Bringmann*, Gerhard Lang, Katja Maksimenka, Andreas Hamm, Tobias A.M. Gulder, Anke Dieter, Alan T. Bull, James E.M. Stach, Niko Kocher, Werner E.G. Müller, Hans-Peter Fiedler

The isolation and structural elucidation of a highly oxygenated angucyclinone bearing an unprecedented ether bridge is described. The compound exhibits considerably high glutaminergic activity towards neuronal cells.

**Evidence for the monophyletic evolution of benzyloisoquinoline alkaloid biosynthesis in angiosperms****pp 1374–1393**

David K. Liscombe, Benjamin P. MacLeod, Natalia Loukanina, Owi I. Nandi, Peter J. Facchini*

Biochemical and molecular phylogenetic approaches were used to investigate the evolution of benzyloisoquinoline alkaloid biosynthesis in angiosperms. The isolation and function characterization of a cDNA encoding (*S*)-norococlaurine synthase from opium poppy (*Papaver somniferum*) is also reported.

**OTHER CONTENTS**

Announcement: The Phytochemical Society of Europe
Author Index
Guide for Authors

p 1394
p I
pp II–III

* Corresponding author

The Editors encourage the submission of articles online, thus reducing publication times. For further information and to submit your manuscript, please visit the journal homepage at <http://www.elsevier.com/locate/phytochem>



ELSEVIER

ISSN 0031-9422

INDEXED/ABSTRACTED IN: *Current Awareness in Biological Sciences (CABS)*, *Curr Cont ASCA*, *Chem. Abstr.*, *BIOSIS Data*, *PASCAL-CNRS Data*, *CAB Inter*, *Cam Sci Abstr*, *Curr Cont/Agri Bio Env Sci*, *Curr Cont/Life Sci*, *Curr Cont Sci Cit Ind*, *Curr Cont SCISEARCH Data*, *Bio Agri Ind*

Also available on
SCIENCE @ DIRECT®
www.sciencedirect.com