

## Contents

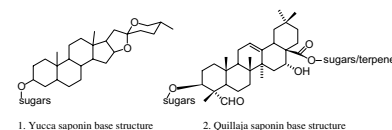
### REVIEW

#### Plant bioactives for ruminant health and productivity

pp 299–322

Simone Rochfort\*, Anthony J Parker, Frank R. Dunshea

Plants can be used to enhance animal health. Research on ruminant specific treatments reinforces the importance of understanding phytochemistry. For example, researchers have recently demonstrated that saponins with different core structures (1 and 2) have disparate effects on methane production. Plant use for animal health is analysed in this review.



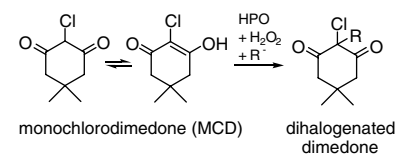
### PROTEIN BIOCHEMISTRY

#### Critical view on the monochlorodimedone assay utilized to detect haloperoxidase activity

pp 323–332

Claudia Wagner, Ilka M. Molitor, Gabriele M. König\*

Haloperoxidase activity guided protein purification from the cyanobacterium *Fischerella ambigua* revealed the isolation of a protein positive in the monochlorodimedone-assay, but an involvement in halogenating processes could not be verified. Our data indicate that the reaction of MCD with proteins of the cytochrome *c* – family leads to unspecific products giving false positive results.



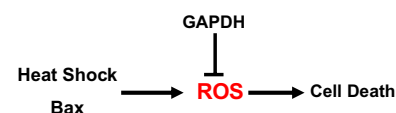
HPO: haloperoxidase  
R: halideion (Br, Cl)

#### Suppression of reactive oxygen species by glyceraldehyde-3-phosphate dehydrogenase

pp 333–338

Dongwon Baek, Yinhua Jin, Jae Cheol Jeong, Hyo-Jung Lee, Haejeong Moon, Jiyoung Lee, Dongjin Shin, Chang Ho Kang, Doh Hoon Kim, Jaesung Nam, Sang Yeol Lee, Dae-Jin Yun\*

Glyceraldehyde-3-phosphate dehydrogenase (GAPDH), a classical glycolytic enzyme, is involved in cellular energy production and has important housekeeping functions. In this report, we show that GAPDH controls generation of  $H_2O_2$  by Bax and heat shock, which in turn suppresses cell death in yeast and plants.

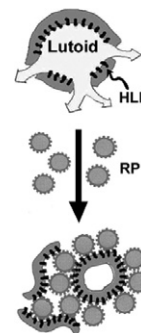


### A role for a *Hevea* latex lectin-like protein in mediating rubber particle aggregation and latex coagulation

pp 339–347

Rapepun Wititsuwannakul\*, Piyaporn Pasitkul, Kamonwan Kanokwiroon, Dhirayos Wititsuwannakul

A lectin-like protein was isolated and purified from the bottom membrane fraction of centrifuged fresh *Hevea brasiliensis* latex. Its general biochemical properties and physiological involvement in rubber latex coagulation is reported.

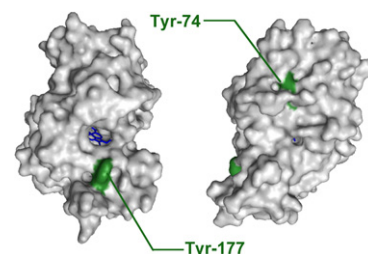


### Role of Tyr residues on the protein surface of cationic cell-wall-peroxidase (CWPO-C) from poplar: Potential oxidation sites for oxidative polymerization of lignin

pp 348–355

Shinya Sasaki, Daisuke Nonaka, Hiroyuki Wariishi, Yuji Tsutsumi\*, Ryuichiro Kondo

Tyr residues located on the protein surface of CWPO-C were considered to be important for oxidation of a wide range of substrates including sinapyl alcohol and polymeric lignin. The Tyr is considered to be a unique oxidation site found in the plant peroxidase family.



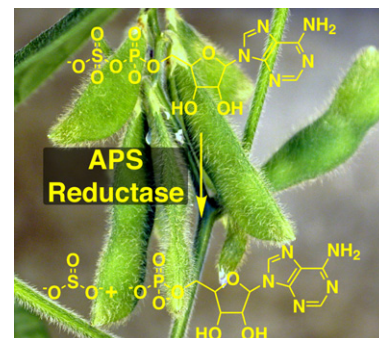
## MOLECULAR GENETICS AND GENOMICS

### The role of 5'-adenylylsulfate reductase in the sulfur assimilation pathway of soybean: Molecular cloning, kinetic characterization, and gene expression

pp 356–364

Pallavi Phartiyal, Won-Seok Kim, Rebecca E. Cahoon, Joseph M. Jez, Hari B. Krishnan\*

5'-Adenylylsulfate reductase from soybean (*Glycine max*) was cloned and the recombinant protein expressed, purified, and biochemically characterized. The tissue distribution and changes in expression as a response to environmental stresses indicate that the sulfur assimilation pathway in soybean plays a key role in early seed development and in responding to cold stress.

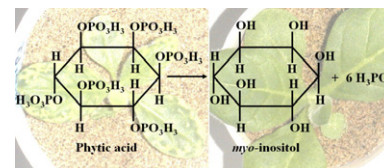


### Phytase activity in tobacco (*Nicotiana tabacum*) root exudates is exhibited by a purple acid phosphatase

pp 365–373

Shiu-Cheung Lung, Andy Leung, Rainbow Kuang, Yu Wang, Priscilla Leung, Boon-Leong Lim\*

Elevated phytase activity was detected in tobacco root exudates in response to phosphorus starvation. The enzyme was purified to homogeneity and its identity was confirmed to be a purple acid phosphatase by molybdate-inhibition assay and cDNA cloning. Its catalytic properties implicate a specific role in mobilizing organic phosphorus in soil.



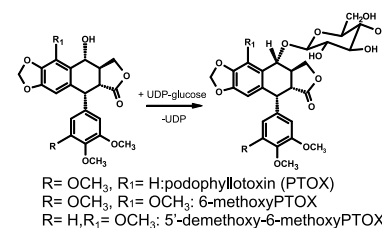
## METABOLISM

UDP-glucose:(6-methoxy)podophyllotoxin 7-*O*-glucosyltransferase from suspension cultures of *Linum nodiflorum*

pp 374–381

Anna Berim, Rainer Ebel, Bernd Schneider, Maike Petersen\*

Cell-free protein extracts from suspension cultures of *Linum nodiflorum* L. (Linaceae) catalyse the 7-*O*- $\beta$ -glucosidation of podophyllotoxin and its 6-methoxy derivative with high specificity. The enzyme activity correlates with lignan accumulation by the plant cells and is competitively inhibited by  $\beta$ -peltatin.

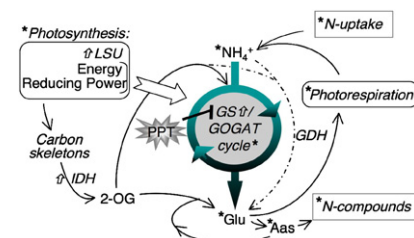


## Response of transgenic poplar overexpressing cytosolic glutamine synthetase to phosphinothricin

pp 382–389

María Belén Pascual, Zhong Ping Jing, Edward G. Kirby, Francisco M. Cánovas, Fernando Gallardo\*

Glutamine synthetase (GS) is a key enzyme in nitrogen metabolism, and the target of the herbicide phosphinothricin (PPT). Overexpression of cytosolic GS enhances the tolerance of poplar to PPT. Increases in GS, large subunit of Rubisco (LSU), and NADP<sup>+</sup>-isocitrate dehydrogenase (IDH) levels could be considered as mechanisms operating in young poplar leaves to overcome the toxic effect of PPT.

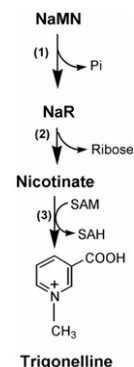


## Biosynthesis of trigonelline from nicotinate mononucleotide in mungbean seedlings

pp 390–395

Xin-Qiang Zheng, Ayu Matsui, Hiroshi Ashihara\*

Enzyme activities and in situ tracer experiments suggest that part of nicotinate mononucleotide synthesised by de novo pyridine nucleotide synthesis is converted to nicotinate via nicotinate riboside, and is used for trigonelline synthesis in mungbean seedlings.



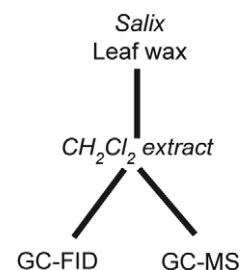
## ECOLOGICAL BIOCHEMISTRY

Cuticular wax composition of *Salix* varieties in relation to biomass productivity

pp 396–402

Mark A. Teece\*, Thomas Zengeya, Timothy A. Volk, Lawrence B. Smart

The leaf cuticular wax composition (fatty acids, *n*-alcohols, *n*-aldehydes, and *n*-alkanes) and biomass productivities of six *Salix* clones grown under similar environmental conditions were determined. Contrary to previous studies, no relationship was found between wax composition and biomass productivity.



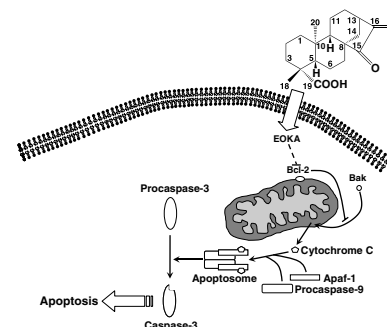


### Cytotoxic and apoptosis-inducing effect of *ent*-15-oxo-kaur-16-en-19-oic acid, a derivative of grandiflorolic acid from *Espeletia schultzei*

pp 432–438

Yarimar Ruiz, Juan Rodríguez, Francisco Arvelo, Alfredo Usubillaga, Mariugenia Monsalve, Nardy Diez, Iván Galindo-Castro\*

*ent*-Kaurenic acid and many natural derivatives of this diterpene are known to have interesting biological properties. *ent*-15-oxo-kaur-16-en-19-oic acid (EOKA), obtained from grandiflorolic acid from *Espeletia schultzei*, induces changes in the expression level of proteins associated with the execution and regulation of apoptosis on the human prostate carcinoma epithelial cell line PC-3.

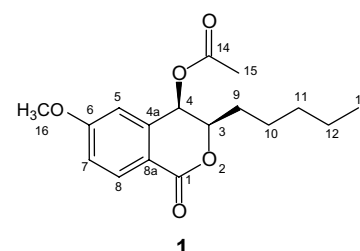


### Dihydroisocoumarin from *Xyris pterygoblephara* active against dermatophyte fungi

pp 439–444

Keller Guilherme Guimarães, José Dias de Souza Filho, Thiago Rennó dos Mares-Guia, Fernão Castro Braga\*

(3*R*,4*R*)-(-)-6-methoxy-3,4-dihydro-3-*n*-pentil-4-acethoxy-1*H*-2-benzopyran-1-one (**1**), isolated from the Brazilian species *Xyris pterygoblephara*, showed potent *in vitro* antifungal activity against clinical isolates of the dermatophytes *Epidermophyton floccosum*, *Trichophyton mentagrophytes* and *Trichophyton rubrum*.

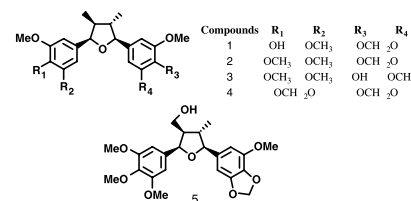


### Trypanocidal tetrahydrofuran lignans from *Peperomia blanda*

pp 445–450

Lidiane Gaspareto Felipe, Debora Cristina Baldoqui, Massuo Jorge Kato, Vanderlan da Silva Bolzani, Elsie Franklin Guimarães, Regina Maria Barreto Cicarelli, Maysa Furlan\*

Five tetrahydrofuran lignans were isolated from the aerial parts of *Peperomia blanda*, of which compounds **1–4** are diastereomeric lignans. The trypanocidal activities of **1–5** were evaluated against epimastigotes of *Trypanosoma cruzi* strain Y.

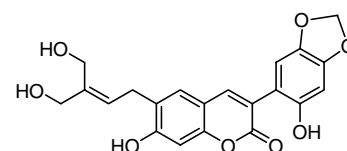


### Antioxidant aryl-prenylcoumarin, flavan-3-ols and flavonoids from *Eysenhardtia subcoriacea*

pp 451–456

José M. Narváez-Mastache, Fernando Novillo, Guillermo Delgado\*

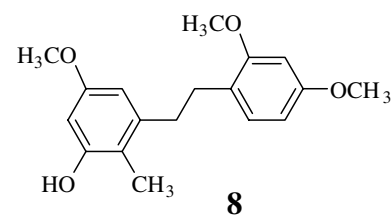
The antioxidant activity assay-guided chemical analysis of *Eysenhardtia subcoriacea* allowed the isolation of the compound named subcoriacin together with known flavan-3-ols as bioactive constituents. Subcoriacin, (+)-catechin, (–)-epicatechin and afzelechin improved the reduced glutathione levels with rat pancreatic homogenate.



**Antibacterial stilbenoids from the roots of *Stemona tuberosa*****pp 457–463**

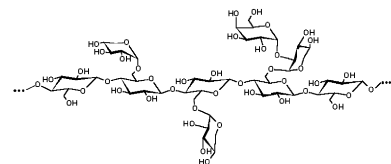
Li-Gen Lin, Xin-Zhou Yang, Chun-Ping Tang, Chang-Qiang Ke,  
Ji-Bao Zhang, Yang Ye\*

Twelve dihydrostilbenes and one phenanthraquinone were isolated from roots of *Stemona tuberosa*. Their structures were established by 1D and 2D NMR and other spectroscopic analyses. Dihydrostilbene **8** exhibited strong activity against the hospital pathogenic bacterium *Bacillus pumilus*.

**Effect of storage xyloglucans on peritoneal macrophages****pp 464–472**

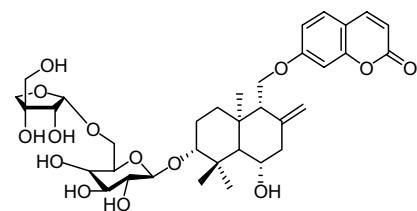
M.M.T. Rosário, G.R. Noleto, J.F. Bento, F. Reicher, M.B.M. Oliveira,  
C.L.O. Petkowicz\*

Xyloglucans isolated from seeds of *Copaifera langsdorffii*, *Hymenaea courbaril* and *Mucuna sloanei* showed immunomodulatory activity.

**CHEMISTRY****Polar secondary metabolites of *Ferula persica* roots****pp 473–478**

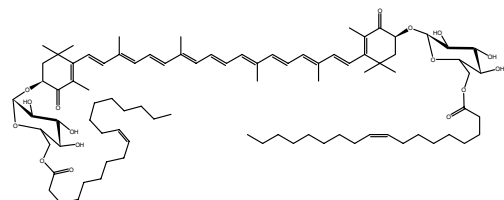
Mehrdad Iranshahi\*, Mehdi Mojarab, Hamid Sadeghian,  
Mohammad Yahya Hanafi-Bojd, Bernd Schneider

Phytochemical investigation of the methanolic extract of the dried roots of *Ferula persica* resulted in four sesquiterpene coumarin glycosides, persicaosides A–D, and two known phytosterol glucosides, sitosterol 3-*O*- $\beta$ -glucoside and stigmasterol 3-*O*- $\beta$ -glucoside.

**Identification of astaxanthin diglucoside diesters from snow alga *Chlamydomonas nivalis* by liquid chromatography–atmospheric pressure chemical ionization mass spectrometry****pp 479–490**

Tomáš Řezanka\*, Linda Nedbalová, Karel Sigler, Vladislav Cepák

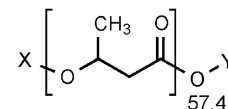
Astaxanthin glucoside esters from snow alga *Chlamydomonas nivalis* were identified by means of liquid chromatography–atmospheric pressure chemical ionization mass spectrometry (LC–MS/APCI) based on preparative HPLC and subsequent identification by microbore LC–MS/APCI. The combination of these two techniques was used to identify more than 100 molecular species. The astaxanthin diglucoside diester was also synthesized to unambiguously confirm its structure.



**Characterization of short-chain poly3-hydroxybutyrate in baker's yeast****pp 491–497**

Yoshikatsu Suzuki\*, Yasuaki Esumi, Hiroyuki Koshino, Masashi Ueki, Yoshiharu Doi

A calcium-polyphosphate complex-derived short-chain poly3-hydroxybutyrate (Yeast cPHA-1) was isolated from baker's yeast (*Saccharomyces cerevisiae*) and characterized.

**Yeast cPHA-1**

cyclic form &gt;60%

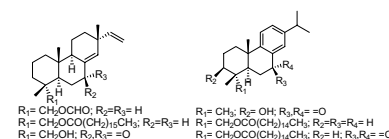
linear form &lt;40%

X=H: ca.19%, Y=H: ca. 4%

**TERPENOIDS****Diterpene constituents of leaves from *Juniperus brevifolia*****pp 498–505**

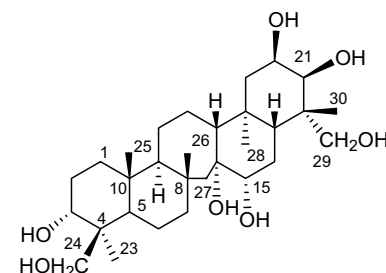
Ana M.L. Seca, Artur M.S. Silva\*, Isabel L. Bazzocchi, Ignacio A. Jimenez

Six abietane and sandaracopimarane derivatives and 15 other known compounds, mainly diterpenes, were isolated from leaves of *Juniperus brevifolia*. Their structures were established on the basis of 1D and 2D NMR and MS evidences.

**Polyhydroxyserratane triterpenoids from *Diphasiastrum complanatum*****pp 506–510**

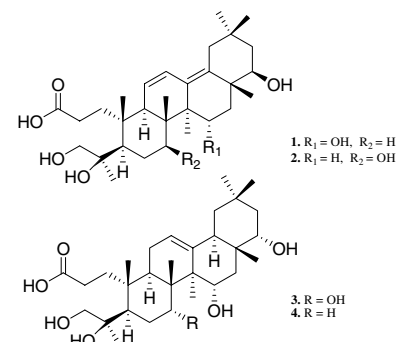
Jian Yan, Ping Yi, Baohui Chen, Lu Lu, Zhongrong Li, Xianmin Zhang, Lin Zhou, Minghua Qiu\*

Five polyhydroxyserratane triterpenoids was isolated from *Diphasiastrum complanatum* including serratane-3 $\alpha$ ,14 $\alpha$ ,15 $\alpha$ ,20 $\beta$ ,21 $\beta$ ,24, 29-heptol (**1**), given the trivial name diphasiastrol.

**A-seco-oleane-type triterpenes from *Phomopsis* sp. (strain HKI0458) isolated from the mangrove plant *Hibiscus tiliaceus*****pp 511–517**

Liya Li, Isabel Sattler\*, Zhiwei Deng, Ingrid Groth, Grit Walther, Klaus-Dieter Menzel, Gudrun Peschel, Susanne Grabley, Wenhan Lin\*

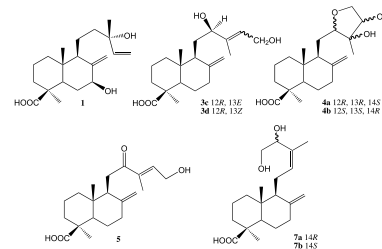
A-seco-oleane-type triterpenes (**1–4**) were isolated from the fermentation broth of a fungus *Phomopsis* sp. (HKI0458), which was isolated from the mangrove plant *Hibiscus tiliaceus* (L.). Their structures were elucidated by extensive spectroscopic data analyses.



**Diterpenoids from the pericarp of *Platycladus orientalis*****pp 518–526**

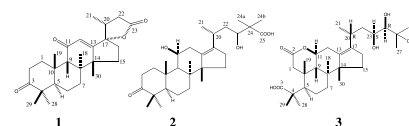
Ya-Zhou Wang, Chun-Ping Tang, Chang-Qiang Ke, Hans-Christoph Weiss,  
Ernst-Rudolf Gesing, Yang Ye\*

Eight labdane-type diterpenes along with 20 known diterpenoid compounds were isolated from the pericarp of *Platycladus orientalis*.

**Alisolide, alisols O and P from the rhizome of *Alisma orientale*****pp 527–532**

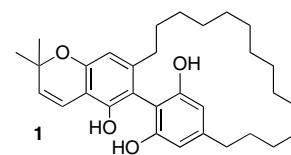
Ming Zhao, Li-Jia Xu, Chun-Tao Che\*

A *nor*-protostane, alisolide (**1**), a rearranged protostane, alisol O (**2**), and a 2,3-*seco*-protostane triterpene, alisol P (**3**), were isolated from the rhizomes of *Alisma orientale*.

**PHENOLICS****Cytotoxic turrianes of *Kermadecia elliptica* from the New Caledonian rainforest****pp 533–540**

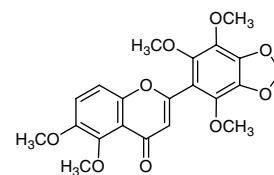
Claire Jolly, Odile Thoison, Marie-Thérèse Martin, Vincent Dumontet,  
Aline Gilbert, Bruno Pfeiffer, Stéphane Léonce, Thierry Sévenet,  
Françoise Guéritte, Marc Litaudon\*

Eight cyclophanes (**1–8**), named kermadecins A–H, were isolated from the bark of *Kermadecia elliptica* (PROTEACEAE). A LC/APCI-MS study provided a reliable method of detection for most of the compounds.

**Flavones from *Struthiola argentea* with anthelmintic activity *in vitro*****pp 541–545**

Sloan Ayers, Deborah L. Zink, Kenneth Mohn, Joanne S. Powell,  
Christine M. Brown, Terry Murphy, Robert Brand, Seef Pretorius,  
Dennis Stevenson, Donald Thompson, Sheo B. Singh\*

Bioassay-guided fractionation of *Struthiola argentea* (Thymelaeaceae) led to the isolation of three anthelmintic flavones **1–3**, including the flavone 5,6,2',5',6'-pentamethoxy-3',4'-methylenedioxyflavone (**3**). The flavone **3** exhibited the most potent *in vitro* activity against *Haemonchus contortus* with 90% inhibition of larval motility (EC<sub>90</sub>) at 3.1 µg/mL.

5,6,2',5',6'-pentamethoxy-3',4'-methylenedioxyflavone (**3**)

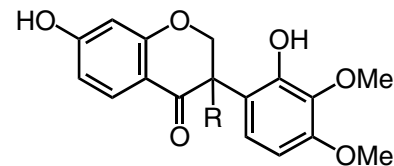


**Estrogenic constituents of the heartwood of *Dalbergia parviflora***

pp 546–552

Kaoru Umehara\*, Kiyomitsu Nemoto, Kyoko Kimijima, Ayako Matsushita, Eri Terada, Orawan Monthakantirat, Wanchai De-Eknamkul, Toshio Miyase, Tsutomu Warashina, Masakuni Degawa, Hiroshi Noguchi

From the heartwood of *Dalbergia parviflora*, five compounds, dalparvin A and B, isodalparvinol A, dalparvinol C, and neokhrinol A, along with 11 known compounds, were isolated and characterized. By evaluating their activity in human breast cancer cells, dalparvin B and isodalparvinol A stimulated both MCF-7 and T-47D cell proliferation, but no isolates showed significant effects on BT20.

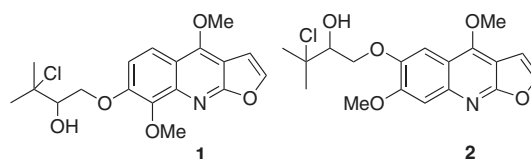


Dalparvin B, R=H  
Dalparvin C, R=OH

**ALKALOIDS****Furoquinoline alkaloids of *Ertela (Monnieria) trifolia* (L.) Kuntze from the Suriname rainforest**

pp 553–557

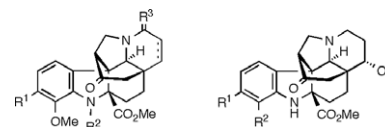
Shugeng Cao, Adnan J. Al-Rehaily, Peggy Brodie, Jan H. Wisse, Etienne Moniz, Stan Malone, David G.I. Kingston\*

**Methyl chanofruticosinate alkaloids from *Kopsia arborea***

pp 558–561

Kuan-Hon Lim, Toh-Seok Kam\*

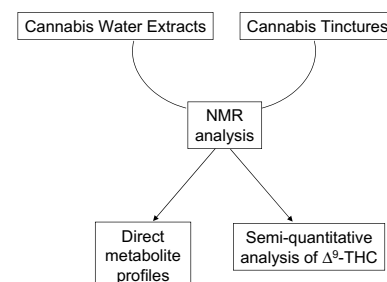
Six alkaloids belonging to the methyl chanofruticosinate group, prunifolines A–F, in addition to six other known methyl chanofruticosinate alkaloids, were isolated from the leaf extract of *Kopsia arborea*.

**GENERAL CHEMISTRY****Direct NMR analysis of cannabis water extracts and tinctures and semi-quantitative data on  $\Delta^9$ -THC and  $\Delta^9$ -THC-acid**

pp 562–570

M. Politi, W. Peschel, N. Wilson, M. Zloh, J.M. Prieto\*, M. Heinrich

Diffusion-edited  $^1\text{H}$  NMR (1D DOSY) and  $^1\text{H}$  NMR with suppression of the ethanol and water signals were used for the analyses of different tinctures and infusions of cannabis.

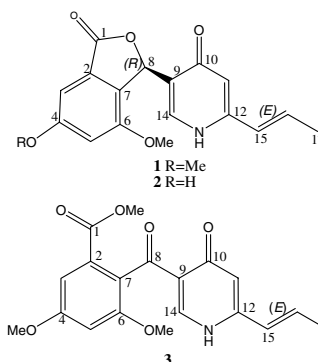


**Penicidones A–C, three cytotoxic alkaloidal metabolites of an endophytic *Penicillium* sp.**

pp 571–576

Hui Ming Ge, Yao Shen, Chun Hua Zhu, Shu Hua Tan, Hui Ding,  
Yong Chun Song, Ren Xiang Tan\*

Penicidones A–C, three cytotoxic alkaloids, were characterized from the culture of *Penicillium* sp. IFB-E022, an endophytic fungal strain on *Quercus variabilis*.



**OTHER CONTENTS**

**Announcement: The Phytochemical Society of North America**

p I

\* 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 covered in the abstract and citation database SCOPUS®. Full text available on ScienceDirect®.

Available online at



[www.sciencedirect.com](http://www.sciencedirect.com)