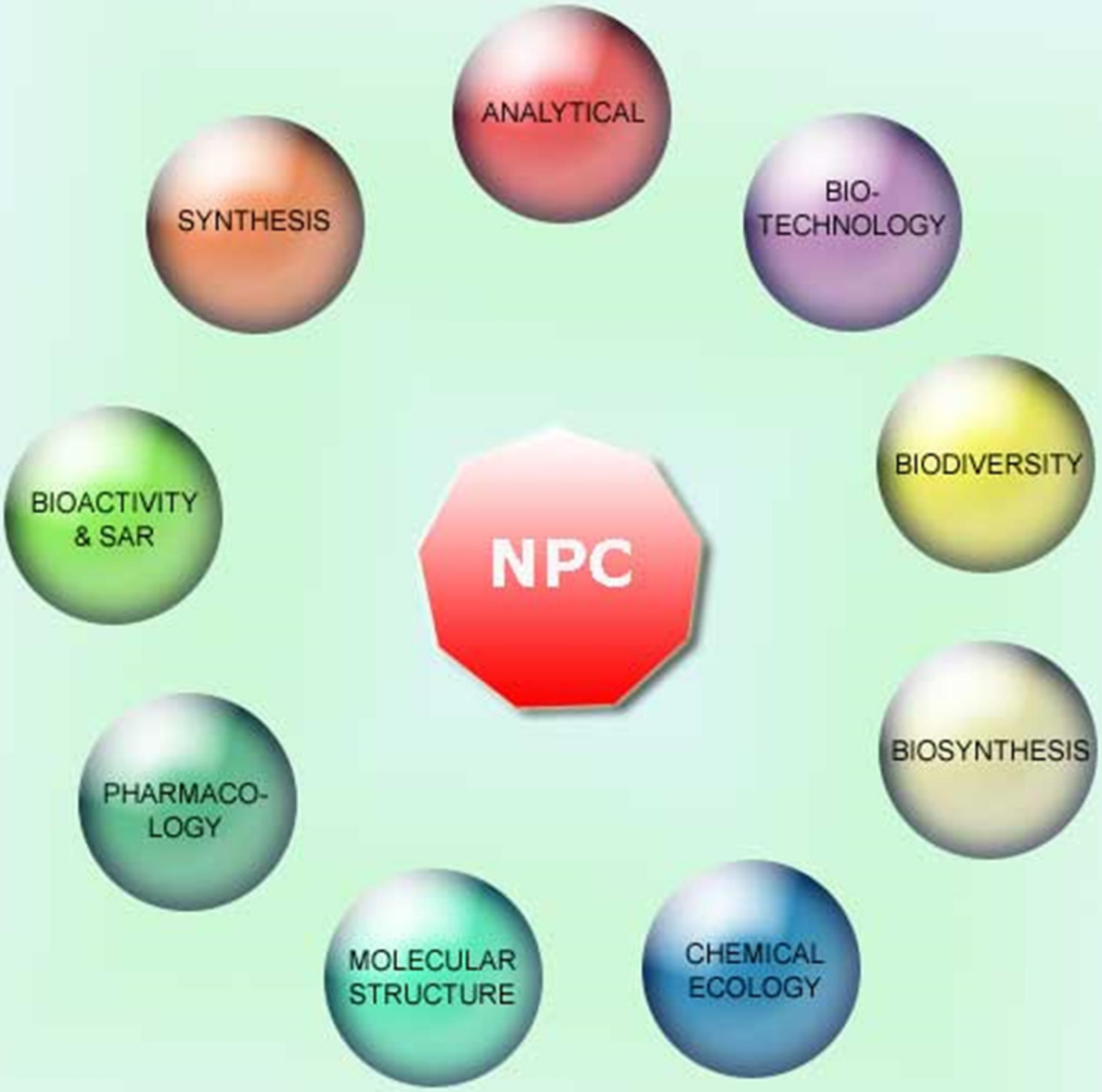
# NATURAL PRODUCT COMMUNICATIONS

An International Journal for Communications and Reviews Covering all Aspects of Natural Products Research




**This Issue is Dedicated to**
**Professor Josep Coll Toledano**
**On the Occasion of his 70th Birthday**

Volume 9. Issue 8. Pages 1059-1222. 2014
ISSN 1934-578X (printed); ISSN 1555-9475 (online)
www.naturalproduct.us

# NPC Natural Product Communications



**EDITOR-IN-CHIEF**

**DR. PAWAN K AGRAWAL**
*Natural Product Inc.*
*7963, Anderson Park Lane,*
*Westerville, Ohio 43081, USA*
*agrawal@naturalproduct.us*

**HONORARY EDITOR**

**PROFESSOR GERALD BLUNDEN**
*The School of Pharmacy & Biomedical Sciences,*
*University of Portsmouth,*
*Portsmouth, PO1 2DT U.K.*
*axuf64@dsl.pipex.com*

**EDITORS**

**PROFESSOR ALEJANDRO F. BARRERO**
*Department of Organic Chemistry,*
*University of Granada,*
*Campus de Fuente Nueva, s/n, 18071, Granada, Spain*
*afbarre@ugr.es*

**PROFESSOR ALESSANDRA BRACA**
*Dipartimento di Chimica Bioorganicae Biofarmacia,*
*Universita di Pisa,*
*via Bonanno 33, 56126 Pisa, Italy*
*braca@farm.unipi.it*

**PROFESSOR DEAN GUO**
*State Key Laboratory of Natural and Biomimetic Drugs,*
*School of Pharmaceutical Sciences,*
*Peking University,*
*Beijing 100083, China*
*gda5958@163.com*

**PROFESSOR YOSHIHIRO MIMAKI**
*School of Pharmacy,*
*Tokyo University of Pharmacy and Life Sciences,*
*Horinouchi 1432-1, Hachioji, Tokyo 192-0392, Japan*
*mimakiy@ps.toyaku.ac.jp*

**PROFESSOR STEPHEN G. PYNE**
*Department of Chemistry*
*University of Wollongong*
*Wollongong, New South Wales, 2522, Australia*
*spyne@uow.edu.au*

**PROFESSOR MANFRED G. REINECKE**
*Department of Chemistry,*
*Texas Christian University,*
*Forts Worth, TX 76129, USA*
*m.reinecke@tcu.edu*

**PROFESSOR WILLIAM N. SETZER**
*Department of Chemistry*
*The University of Alabama in Huntsville*
*Huntsville, AL 35809, USA*
*wsetzer@chemistry.uah.edu*

**PROFESSOR YASUHIRO TEZUKA**
*Faculty of Pharmaceutical Sciences*
*Hokuriku University*
*Ho-3 Kanagawa-machi, Kanazawa 920-1181, Japan*
*y-tezuka@hokuriku-u.ac.jp*

**PROFESSOR DAVID E. THURSTON**
*Department of Pharmaceutical and Biological Chemistry,*
*The School of Pharmacy,*
*University of London, 29-39 Brunswick Square,*
*London WC1N 1AX, UK*
*david.thurston@pharmacy.ac.uk*

**ADVISORY BOARD**

Prof. Viqar Uddin Ahmad
*Karachi, Pakistan*

Prof. Giovanni Appendino
*Novara, Italy*

Prof. Yoshinori Asakawa
*Tokushima, Japan*

Prof. Roberto G. S. Berlinck
*São Carlos, Brazil*

Prof. Anna R. Bilia
*Florence, Italy*

Prof. Maurizio Bruno
*Palermo, Italy*

Prof. César A. N. Catalán
*Tucumán, Argentina*

Prof. Josep Coll
*Barcelona, Spain*

Prof. Geoffrey Cordell
*Chicago, IL, USA*

Prof. Fatih Demirci
*Eskişehir, Turkey*

Prof. Dominique Guillaume
*Reims, France*

Prof. Ana Cristina Figueiredo
*Lisbon, Portugal*

Prof. Cristina Gracia-Viguera
*Murcia, Spain*

Prof. Duvvuru Gunasekar
*Tirupati, India*

Prof. Hisahiro Hagiwara
*Niigata, Japan*

Prof. Kurt Hostettmann
*Lausanne, Switzerland*

Prof. Martin A. Iglesias Arteaga
*Mexico, D. F, Mexico*

Prof. Leopold Jirovetz
*Vienna, Austria*

Prof. Vladimir I Kalinin
*Vladivostok, Russia*

Prof. Niel A. Koorbanally
*Durban, South Africa*

Prof. Chiaki Kuroda
*Tokyo, Japan*

Prof. Hartmut Laatsch
*Gottingen, Germany*

Prof. Marie Lacaille-Dubois
*Dijon, France*

Prof. Shoei-Sheng Lee
*Taipei, Taiwan*

Prof. Imre Mathe
*Szeged, Hungary*

Prof. Ermino Murano
*Trieste, Italy*

Prof. M. Soledade C. Pedras
*Saskatoon, Canada*

Prof. Luc Pieters
*Antwerp, Belgium*

Prof. Peter Proksch
*Düsseldorf, Germany*

Prof. Phila Raharivelomanana
*Tahiti, French Polynesia*

Prof. Luca Rastrelli
*Fisciano, Italy*

Prof. Stefano Serra
*Milano, Italy*

Prof. Monique Simmonds
*Richmond, UK*

Dr. Bikram Singh
*Palampur, India*

Prof. John L. Sorensen
*Manitoba, Canada*

Prof. Johannes van Staden
*Scottsville, South Africa*

Prof. Valentin Stonik
*Vladivostok, Russia*

Prof. Winston F. Tinto
*Barbados, West Indies*

Prof. Sylvia Urban
*Melbourne, Australia*

Prof. Karen Valant-Vetschera
*Vienna, Austria*


## INFORMATION FOR AUTHORS

Full details of how to submit a manuscript for publication in Natural Product Communications are given in Information for Authors on our Web site http://www.naturalproduct.us.


Authors may reproduce/republish portions of their published contribution without seeking permission from NPC, provided that any such republication is accompanied by an acknowledgment (original citation)-Reproduced by permission of Natural Product Communications. Any unauthorized reproduction, transmission or storage may result in either civil or criminal liability.

The publication of each of the articles contained herein is protected by copyright. Except as allowed under national "fair use" laws, copying is not permitted by any means or for any purpose, such as for distribution to any third party (whether by sale, loan, gift, or otherwise); as agent (express or implied) of any third party; for purposes of advertising or promotion; or to create collective or derivative works. Such permission requests, or other inquiries, should be addressed to the Natural Product Inc. (NPI). A photocopy license is available from the NPI for institutional subscribers that need to make multiple copies of single articles for internal study or research purposes.



**To Subscribe**: Natural Product Communications is a journal published monthly. 2014 subscription price: US$2,395 (Print, ISSN# 1934-578X); US$2,395 (Web edition, ISSN# 1555-9475); US$2,795 (Print + single site online); US$595 (Personal online). Orders should be addressed to Subscription Department, Natural Product Communications, Natural Product Inc., 7963 Anderson Park Lane, Westerville, Ohio 43081, USA. Subscriptions are renewed on an annual basis. Claims for nonreceipt of issues will be honored if made within three months of publication of the issue. All issues are dispatched by airmail throughout the world, excluding the USA and Canada.

NPC Natural Product Communications

2014
Vol. 9
No. 8
1123 - 1124

# New Pseudoguaiane Derivatives from *Inula aschersoniana* Janka var. *aschersoniana*

**Antoaneta Trendafilova[a,*], Milka Todorova[a], Viktoriya Genova[a], Pavletta Shestakova[a], Dimitar Dimitrov[b], Milka Jadranin[c] and Slobodan Milosavljevic[d]**

[a]*Institute of Organic Chemistry with Centre of Phytochemistry*, *Bulgarian Academy of Sciences*, *1113 Sofia*, *Bulgaria*
[b]*National Museum of Natural History*, *Bulgarian Academy of Sciences*, *1000 Sofia*, *Bulgaria*
[c]*Center for Chemistry, Institute for Chemistry*, *Technology and Metallurgy*, *University of Belgrade*, *11000 Belgrade*, *Serbia*
[d]*Faculty of Chemistry*, *University of Belgrade*, *11000 Belgrade*, *Serbia*

*trendaf@orgchm.bas.bg*

**Received: May 12th, 2014; Accepted: June 20th, 2014**

The aerial parts of *Inula aschersoniana* Janka var. *aschersoniana* afforded parthenolide, diepoxycostunolide, inusoniolide, chrysosplenol C and four new pseudoguaiane-type sesquiterpenoids. Their structures were determined using spectral methods and relative stereochemistry by NOESY correlations.

**Keywords:** *Inula aschersoniana*, Sesquiterpene lactones, Pseudoguaiane derivatives.

*Inula aschersoniana* Janka {synonyms *I. verbascifolia* (Janka) subsp. *aschersoniana* (Janka) Tutin*, I. candida* (L.) Cass. subsp. *aschersoniana* (Janka) Hayek*, I. conyza* DC. subsp. *verbascifolia* Nyman*, I. macedonica* Hausskn.}, family Asteraceae, is a subendemic species in the Balkan peninsula and Anatolia with areas of distribution in Bulgaria, Greece, Macedonia, and Turkey [1a]. There are three varieties of *I. aschersoniana* in Bulgaria: *madarense*, *macedonica* and *aschersoniana* [1b,1c]. A literature survey revealed the isolation of four sesquiterpene lactones from this species: parthenolide [2a,2b], 8β-hydroxy-11α,13-dihydro eremanthin [2a], diepoxycostunolide and inusoniolide [2b], while for *I. verbascifolia* subsp*. methanea* of Greek origin are reported 9β-hydroxyparthenolide, four esters of the latter, two guaianolides, inusoniolide and its 4-*O*-dihydroderivative [2c-2e].

The phytochemical investigation of *I. aschersoniana* Janka var. *aschersoniana* afforded parthenolide [3], diepoxycostunolide [2b], inusoniolide [2b], chrysosplenol C [4] and four new pseudoguaiane derivatives(**1-4**). Compounds forming two well defined TLC spots were isolated (samples **A** and **B**) by PTLC. The HRESIMS of **A** displayed a quasimolecular peak at *m/z* 349.20085 $[M+H]^+$ corresponding to the molecular formula $C_{20}H_{28}O_5$. $^1H$ and $^{13}C$ NMR spectra (Table 1) exhibited the characteristic signals for angeloyloxy and senecioyloxy groups. Further, duplicate signals for one secondary ($\delta_H$ 1.05/1.06, d, 7.3 Hz) and one tertiary ($\delta_H$ 1.13/1.15 s) methyl groups, one exomethylene ($\delta_H$ 5.65, 6.24/5.65, 6.25), and a proton geminal to the ester residue ($\delta_H$ 5.35/5.40, dd, *J* 9.0 and 1.5 Hz), all of them in ratio 1:1.5 were observed. Obviously the studied sample **A** is an inseparable mixture of two esters (**1** and **2**) of one sesquiterpenoid. Analysis of the COSY spectrum showed the correlations H-3/H-2/H-1/H-10/H-9/H-8/H-7/H-6 and H-10/H-14. Connection of C-3 to C-6 through quaternary carbons C-4 and C-5 was established by HMBC cross-peaks of C-4 ($\delta_C$ 214.72/214.25) with H-3, H-2' and H-15, and C-5 ($\delta_C$ 51.15) with H-1, H-2', H-10 and H-15. The position of a COOH group at C-12 was suggested from the lack of corresponding protons and the correlation between C-12 ($\delta_C$ 171.14) with H-13 and H-13'. Finally, the pseudoguaiane skeleton was confirmed by the $^1H$-$^1H$ correlations observed in the TOCSY spectrum of sample A which displays correlations throughout the entire coupling network. The

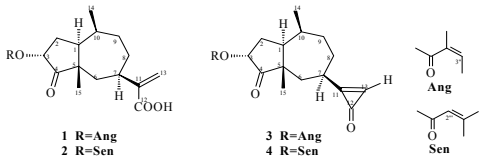



**Figure 1:** Structures of compounds **1-4**

**Table 1**: NMR spectral data of compounds **1** and **2** in $CDCl_3$.

| No | $\delta_H$ (mult.,J Hz) **1/2** | $\delta_C$[#] **1/2** | HMBC (C→H) | NOESY |
|---|---|---|---|---|
| 1 | 2.54 ddd (5.4, 7.0, 13.5) | 43.09/43.12 | 2, 3, 5, 9, 10, 14, 15 | 2', 7, 10 |
| 2 | 2.44 ddd (9.0, 13.5, 13.5) | 29.73/29.86 | 1, 3 | 3, 15 |
| 2' | 1.72 ddd (1.5, 7.0, 13.5) | | | 1 |
| 3 | 5.35/5.40 dd (1.5, 9.0) | 70.87/71.47 | 2' | 15 |
| 4 | - | 214.72/214.25 | 3, 2', 15 | |
| 5 | - | 51.15 | 1, 2', 10, 15 | |
| 6 | 2.34/2.35 dd (3.1,14.4) | 37.32/37.40 | 1, 15 | 7 |
| 6' | 1.68 m* | | | 15 |
| 7 | 2.75 m | 36.32/36.29 | 6, 13, 13', | 1, 6, 8 |
| 8 | 1.88 m* | 31.16/31.07 | 6, 10 | |
| 8' | 1.60 m | | | |
| 9 | 1.70 m* (2H) | 33.86 | 8', 10, 14, | |
| 10 | 2.05 m | 34.64/34.61 | 1, 2, 8, 14 | 1 |
| 11 | - | 146.02 | 6, 8', 13 | |
| 12 | - | 171.14 | 13, 13' | |
| 13 | 6.24/6.25 s | 124.84 | | |
| 13' | 5.65 s | | | |
| 14 | 1.05/1.06 d (7.3) | 16.89 | | 15 |
| 15 | 1.13/1.15 s | 21.61/21.68 | | 2, 3, 14 |
| | Angeloyl | | | |
| 1" | - | 167.27 | 3, 5" | |
| 2" | - | 127.33 | | |
| 3" | 6.10 qq (7.3, 1.2) | 138.95 | 4", 5" | |
| 4" | 1.97 dq (7.3, 1.2) | 15.93 | | |
| 5" | 1.90 dq (1.2, 1.2)* | 20.58 | | |
| | Senecioyl | | | |
| 1"' | - | 165.73 | 3, 4"' | |
| 2"' | 5.73 brs | 115.32 | 4"', 5"' | |
| 3"' | - | 158.47 | | |
| 4"' | 2.17 d (1.2) | 20.42 | | |
| 5"' | 1.90 d (1.2)* | 27.51 | | |

[#]Assignment determined by HSQC and HMBC.*overlapped signals.

overall analysis of the spectral data of **A** confirmed the pseudoguaiane structure of **1** and **2** with a C-3 connected ester side chain, C-4 carbonyl and C-12 carboxyl groups. The literature survey revealed that the obtained compounds were 3-acyloxy derivatives of damsinic acid [5a]. The relative configuration of **1** and **2** was determined by NOESY correlations. Assuming, on biogenetic grounds, a β-orientation of the C-7 side chain and NOESY (Table 1) cross peaks of H-7/H-1, H-1/H-10, H-15/H-3 and H-15/H-14 revealed a β-disposition of the C-10 and C-5 methyl

groups, an α-orientation of the C-3 ester residue and a *trans*-fusion of the 5/7-membered rings in the pseudoguaiane structure. The newly isolated compounds were identified as 3α-angeloyloxy- and 3α-senecioyloxydamsinic acids. It is worthy of note that only eudesmane sesquiterpene acids have been isolated from *Inula* species so far [5b].

**Table 2**: NMR spectral data of compounds **3** and **4** in $CDCl_3$.

| No | $\delta_H$ (mult., J Hz) **3/4** | $\delta_C$[#] **3/4** | HMBC (C→H) | NOESY |
|---|---|---|---|---|
| 1 | 2.51 m | 44.70/44.74 | 2', 6', 9, 9',14, 15 | 2', 7,10 |
| 2 | 2.34 m* | 30.15/30.12 | 1 | |
| 2' | 1.82/1.86 ddd (1.4, 6.9, 14.6) | | | 1 |
| 3 | 5.21/5.25 dd (1.4, 9.0) | 71.83, 71.24 | 2' | 2, 15 |
| 4 | - | 215.81/215.41 | 2, 2', 3, 6, 15 | |
| 5 | - | 52.04/52.08 | 1, 2, 2', 6, 6', 7,15 | |
| 6 | 2.32 m* | 38.46/38.62 | 1, 7, 8, 8', 9, 10,15 | |
| 6' | 1.96 m* | | | |
| 7 | 3.21 m | 36.78/36.86 | 6, 6', 8, 8', 9', 13 | 1 |
| 8 | 2.11 m* | 26.89 | 6, 6', 7, 9, 9' | |
| 8' | 1.96 m* | | | |
| 9 | 1.96 m* | 32.23/32.20 | 7, 14 | |
| 9' | 1.59 m | | | 13, 14, 15 |
| 10 | 2.13 m* | 32.96/32.91 | 1, 2, 6, 8, 9', 14 | |
| 11 | - | 157.53 | 7 | |
| 12 | - | 173.80 | 7, 13 | |
| 13 | 8.45/8.46 d (0.9) | 147.57/147.62 | 7 | 9', 14, 15 |
| 14 | 0.99/1.00 d (7.3) | 17.24/17.26 | 1, 9 | 9, 13 |
| 15 | 1.04/1.05 s | 19.02 | 1, 6, 6' | 3, 9', 13 |
| | Angeloyl | | | |
| 1" | - | 166.81 | 3 | |
| 2" | - | 127.10 | | |
| 3" | 6.12 qq (7.3, 1.2) | 139.36 | | |
| 4" | 1.97 dq (7.3, 1.2) | 15.96 | | |
| 5" | 1.90 dq (1.2, 1.2)* | 20.57 | | |
| | Senecioyl | | | |
| 1"' | - | 165.34 | 3 | |
| 2"' | 5.68 brs | 115.04 | | |
| 3"' | - | 158.90 | | |
| 4"' | 2.17 d (1.2) | 27.54 | | |
| 5"' | 1.90 d (1.2)* | 20.43 | | |

[#]Assignment determined by HSQC and HMBC.*overlapped signals

The HRESIMS of sample **B** showed a quasimolecular peak at *m/z* 331.19050 $[M+H]^+$ corresponding to a molecular formula $C_{20}H_{26}O_4$. Comparison of $^1H$ and $^{13}C$ NMR data of **B** (Table 2) with those of **A** (Table 1) established close similarity. Sample **B** also contained two components (**3** and **4**), the same as sample **A**. The main difference between **A** and **B** in their $^1H$ NMR spectra is related to the C-7 side chain. Instead of signals for geminal vinyl protons H-13 and H-13', a signal for an olefinic proton appeared as a pair of doublets at δ 8.45/8.46 ppm, with $J$ = 0.9 Hz. The IR absorptions at 1830 and 1580 $cm^{-1}$, the presence of a carbonyl function ($\delta_C$ 173.80) and its β-effect on the chemical shift of the olefinic proton confirmed the presence of a cyclopropenone ring. The relative stereochemistry of **3** and **4** was determined from the correlations in NOESY spectrum (Table 2). These compounds were named aschersonianone A (**3**) and aschersonianone B (**4**). To the best of our knowledge, only few compounds with a cyclopropenone ring have been isolated from natural sources – two acids (alutacenoic acids A and B) from fungi [5c] and four sesquiterpene derivatives (3 eremophilanes and one eudesmane) from *Telekia speciosa* [5d] and *I. linearii*folia[5e].

## Experimental

***General:*** IR, Bruker Tensor 27 FT-IR spectrometer; NMR, Bruker Avance II+ 600 NMR spectrometer; HRESIMS, Agilent 6210 LC/ESI TOF System;CC, Silica gel 60(230–400 mesh); TLC, silica gel 60 $F_{254}$ plates; compounds were visualised by spraying with conc. $H_2SO_4$ followed by heating.

***Plant material:*** Wild growing *I. aschersoniana* was collected in July 2013 from eastern Rhodope Mts in Bulgaria. A voucher specimen (SOM169980) has been deposited in the Herbarium of the Institute of Biodiversity and Ecosystem Research, Sofia, Bulgaria.

***Extraction and isolation:*** Dried and powdered plant material (41 g) was defatted with *n*-hexane and then successively extracted by cold maceration with $CHCl_3$. After filtration, the solvent was evaporated under vacuum at low temperature (40°C) to give the crude extract (2 g), which was submitted to CC on silica gel. Elution with a mixture $CHCl_3$/acetone with increasing polarity afforded 6 fractions (TLC monitoring). Four main TLC spots were observed. PTLC (silica gel, *n*-hexane/diethyl ether, 1:1) of portions of Fr. 2 (528 mg) and Fr. 3 (205 mg) afforded parthenolide (47.4 mg) and diepoxycostunolide (10 mg), respectively. PTLC (silica gel, *n*-hexane/$Et_2O$, 1:1) of Fr. 4 (5 mg) gave 1.1 mg of inusoniolide. Further, **1/2** (5.0 mg) and **3/4** (2.2 mg) were isolated from Fr. 5 (100 mg) by PTLC (*n*-hexane/acetone, 2:1). PTLC (*n*-hexane/acetone 2:1) of Fr. 6 (45 mg) afforded chrysosplenol (20 mg).

**3α-Angeloyloxydamsinic acid (1) and 3α-senecioyloxydamsinic acid (2) (mixture)**
Colorless oil.
IR (film) $\nu_{max}$ $cm^{-1}$: 1756 (C=O, 5-membered ring), 1717, 1695 (C=O, ester), 1651 (C=C).
$^1H$ (600 MHz, $CDCl_3$) and $^{13}C$ NMR (150 MHz, $CDCl_3$): Table 1.
HRESIMS (positive mode) *m/z*:349.20085 $[M+H]^+$ (calculated for $C_{20}H_{28}O_5$, 349.20088).

**Aschersonianone A (3) and aschersonianone B (4) (mixture)**
Colorless oil.
IR (film) $\nu_{max}$$cm^{-1}$: 1830, 1580 (cyclopropenone), 1753 (C=O, 5-membered ring), 1718 (C=O, ester), 1650 (C=C).
$^1H$ (600 MHz, $CDCl_3$) and $^{13}C$ NMR (150 MHz, $CDCl_3$): Table 2.
HRESIMS (positive mode) *m/z*:331.19050 $[M+H]^+$ (calculated for $C_{20}H_{26}O_4$, 331.19030)

## References


[1] (a) http://www.globalspecies.org/ntaxa/2286300; (b) Delipavlov D, Ceschmedziev I, Popova M, Terzijski D, Kovachev I (**2003**) *Vascular plants of Bulgaria Guide*, Univ. of Agriculture, Plovdiv, p. 591; (c) Stojanov N, Stefanov B, Kitanov B **(1967)** *Flora of Bulgaria*, Vol. ***2***, Nauka i Izkustvo, Sofia, pp. 1077-1078 (in Bulgarian).

[2] (a) Papanov GY, Malakov PY, Bohlmann F.(**1980**) 8β-Hydroxy-dihydroeremanthin-ein neues guajanolid aus *Inula aschersoniana*. *Phytochemistry*, ***19***, 152-152; (b) Bloszyk E, Budesinsky M, Daniewski WM, Peskova E, Drozdz B, Holub M. (**1990**) Sesquiterpene lactones of *Inula aschersoniana* Janka var. *aschersoniana* species. *Collection of Czech Chemical Communications*, ***55***, 1562-1567; (c) Harvala E, Aligiannis N, Skaltsounis AL, Pratsinis H, Lambrinidis G, Harvala C, Chinou I. (**2002**) Cytotoxic germacranolides from *Inula verbascifolia* subsp. *methanea. Journal of Natural Products*, ***65***, 1045-1048; (d) Ahmed AA, Mohamed AEHH, Tzakou O, Petropoulou A, Hasan ME, El-Maghraby MA, Zeller KP. **(2003)**Terpenes from *Inula verbascifolia*. *Phytochemisty*, ***62***, 1191-1194; (e) Mohamed AEHH, Mahmoud, HEH, Abdellatif FF, Mohamed YS, Ahmed AA, Ohta SH. (**2013**) New guaianolide-type sesquiterpene lactones from *Inula verbascifolia*. *Zeitschrift für Naturforschung*, ***68c***, 175-180.

[3] Jacobsson U, Kumar V, Saminathan SH. (**1995**) Sesquiterpene lactones from *Michelia champaca*. *Phytochemistry*, ***39***, 839–844.

[4] Huong DT, Kamperdick CH, Sung TV (**2004**) Homogentisic acid derivatives from *Miliusa balansae*. *Journal of Natural Products*, ***67***, 445-447.

[5] (a) Doskotch RW, Hufford CD. (**1970**) The structure of damsinic acid, a new sesquiterpene from *Ambrosia ambros*(Cav.) Paynelioides. *Journal of Organic Chemistry*, ***35***, 486-490; (b) Zhao YM, Zhang ML, Shi QW, Kiyota H. (**2006**) Chemical constituents of plants from genus *Inula*. *Chemistry and Biodiversity*, ***3***, 371-384; (c) Kogen H, Kiho T, Tago K, Miyamoto S, Fujioka T, Otsuka N, Suzuki-Konagai K, Ogita T. (**2000**) Alutacenoic acids A and B, rare naturally occurring cyclopropenone derivatives isolated from fungi: potent non-peptide factor. XIIIa Inhibitors. *Journal of the American Chemical Society*, ***122***, 1842-1843; (d) Bohlmann F, Jakupovic J, Mueller L, Schuster A.(**1981**)Naturlich vorkommen decyclopropenon-derivate. *Angewandte Chemie*, ***93***, 280-281; (e) Nie LY, Qin JJ, Huang Y, Yan L, Liu YB, Pan YX, Jin HZ, Zhang WD. (**2010**) Sesquiterpenoids from *Inula linearii*folia inhibit nitric oxide production. *Journal of Natural Products*, ***73***, 1117–1120.

**Evaluation of Anti-melanoma Activities of (1*S*,2*E*,4*R*,6*E*,8*R*,11*S*,12*R*)-8,12-epoxy-2,6-cembradiene-4,11-diol, (1*S*,2*E*,4*R*,6*E*,8*S*,11*R*,12*S*)-8,11-epoxy-4,12-epoxy-2,6-cembradiene and (1*S*,4*R*,13*S*)-cembra-2*E*,7*E*,11*E*-trien-4,13-diol from the Red Sea soft coral *Sarcophyton glaucum***
Pawel T. Szymanski, Safwat A. Ahmed, Mohamed M. Radwan, Sherief I. Khalifa and Hesham Fahmy **1143**

**Spiculisporic Acid E, a New Spiculisporic Acid Derivative and Ergosterol Derivatives from the Marine-Sponge Associated Fungus *Talaromyces trachyspermus* (KUFA 0021)**
Decha Kumla, Tida Dethoup, Suradet Buttachon, Narong Singburaudom, Artur M.S. Silva and Anake Kijjoa **1147**

**Chemical Composition of Bioactive Alkaloid Extracts from Some *Narcissus* Species and Varieties and their Biological Activity**
Jana Havlasová, Marcela Šafratová, Tomáš Siatka, Šárka Štěpánková, Zdeněk Novák, Miroslav Ločárek, Lubomír Opletal, Martina Hrabinová, Daniel Jun, Nina Benešová, Jiří Kuneš and Lucie Cahlíková **1151**

**Quantititative Determination of Lycorine and Galanthamine in *Galanthus trojanus* and *G. cilicicus* by HPLC-DAD**
Gulen Irem Kaya, Derya Cicek Polat, Buket Sarikaya, Mustafa Ali Onur and Nehir Unver Somer **1157**

**Anthranilic Acid Derivatives and Other Components from *Ononis pusilla***
Lyes Khouni, Christophe Long, Hamada Haba, Nicolas Molinier and Mohammed Benkhaled **1159**

**Trigonelline Accumulation in Leaves of *Panicum virgatum* Seedlings**
Lauren M. Schwartz, Andrew J. Wood and David J. Gibson **1163**

**New Phenylpropanoid-Substituted Flavan-3-ols from Pu-er Ripe Tea**
Mu-Ke Tao, Min Xu, Hong-Tao Zhu, Rong-Rong Cheng, Dong Wang, Chong-Ren Yang and Ying-Jun Zhang **1167**

**Parvisides A and B, New Glucosides from *Galinsoga parviflora***
Nighat Afza, Abdul Malik, Shazia Yasmeen, Muhammad Irfan Ali, Sadia Ferheen and Rasool Bakhsh Tareen **1171**

**Structure Activity Relationships of Flavonoids as Potent α-Amylase Inhibitors**
Erdong Yuan, Benguo Liu, Qingyi Wei, Jiguo Yang, Lei Chen and Qiong Li **1173**

**Two New Anxiolytic Phenanthrenes Found in the Medullae of *Juncus effusus***
Yang Wang, Gui-Yun Li, Qian Fu, Tai-Sen Hao, Jian-Mei Huang and Hai-Feng Zhai **1177**

**A New Depside from *Usnea aciculifera* Growing in Vietnam**
Tuong L. Truong, Vo T. Nga, Duong T. Huy, Huynh B. L. Chi and Nguyen K. P. Phung **1179**

**Chemical Analysis of Volatile Oils from West Himalayan Pindrow Fir *Abies pindrow***
Rajendra C. Padalia, Ram S. Verma, Amit Chauhan, Prakash Goswami and Chandan S. Chanotiya **1181**

**Characterization of Volatiles of Necrotic *Stenocereus thurberi* and *Opuntia littoralis* and Toxicity and Olfactory Preference of *Drosophila melanogster, D. mojavensis wrigleyi*, and *D. mojavensis sonorensis* to Necrotic Cactus Volatiles**
Cynthia R. Wright and William N. Setzer **1185**

## *Accounts/Reviews*

**Cytotoxicity Studies of Lycorine Alkaloids of the Amaryllidaceae**
Jerald J. Nair and Johannes van Staden **1193**

**Warfarin Interactions with Medicinal Herbs**
Nataša Milić, Nataša Milošević, Svetlana Goločorbin Kon, Teodora Božić, Ludovico Abenavoli and Francesca Borrelli **1211**

**Acemannan, an Extracted Polysaccharide from *Aloe vera*: A Literature Review**
Gerardo Daniel Sierra-García, Rocío Castro-Ríos, Azucena González-Horta, Jorge Lara-Arias and Abelardo Chávez-Montes **1217**

# Natural Product Communications
# 2014
Volume 9, Number 8

Contents

## Articles dedicated to Prof. Josep Coll Toledano on the Occasion of his 70th Birthday

***Original Paper*** ***Page***

**Sesquiterpene Hydrocarbons from the Liverwort *Treubia isignensis* var. *isignensis* with Chemotaxonomic Significance**
Paul Coulerie, Mohammed Nour, Louis Thouvenot and Yoshinori Asakawa **1059**

**Microbial Transformation of the Diterpene 7-*epi*-Foliol by *Fusarium fujikuroi***
Braulio M. Fraga, Carlo Bressa, Pedro González and Ricardo Guillermo **1061**

**$^{1}$H and $^{13}$C NMR Analysis of the *neo*-Clerodane Diterpenoid Scutecyprin**
Plamen N. Penchev, Stefka R. Nachkova, Tonka A. Vasileva and Petko I. Bozov **1065**

**Ecdysteroid Profiles of Two *Ajuga* species, *A. iva* and *A. remota***
Ahmed Bakrim, Johnpeter Ngunjiri, Sophie Crouzet, Louis Guibout, Christine Balducci, Jean-Pierre Girault and René Lafont **1069**

**Antiparasitic Indole Alkaloids from *Aspidosperma desmanthum* and *A. spruceanum* from the Peruvian Amazonia**
Matías Reina, Lastenia Ruiz-Mesia, Wilfredo Ruiz-Mesia, Frida Enriqueta Sosa-Amay, Leonor Arevalo-Encinas, Azucena González-Coloma and Rafael Martínez-Díaz **1075**

**Analysis of Bioactive Amaryllidaceae Alkaloid Profiles in *Lycoris* Species by GC-MS**
Ying Guo, Natalia B. Pigni, Yuhong Zheng, Jean Paulo de Andrade, Laura Torras-Claveria, Warley de Souza Borges, Francesc Viladomat, Carles Codina and Jaume Bastida **1081**

**Mechanistic Studies on the Intramolecular Cyclization of *O*-Tosyl Phytosphingosines to Jaspines**
Ramón Crehuet, David Mormeneo, Josep M. Anglada and Antonio Delgado **1087**

**Chemistry and Biological Activity of Coumarins at Molecular Level**
Hugo A. Garro, Celina García, Víctor S. Martín, Carlos E. Tonn and Carlos R. Pungitore **1091**

**Chemoenzymatic Solvent-free Synthesis of 1-Monopalmitin Using a Microwave Reactor**
Rubén Torregrosa, Mercé Balcells, Mercé Torres and Ramon Canela-Garayoa **1095**

**EAG Responses Increase of *Spodoptera littoralis* Antennae after a Single Pheromone Pulse**
Carmen Quero, Berta Vidal and Angel Guerrero **1099**

**Cuticular and Internal Chemical Composition of Biting Midges *Culicoides* spp. (Diptera: Ceratopogonidae), Potential Vectors of Viral Diseases**
Mikel González, Sergio López, Gloria Rosell, Arturo Goldarazena and Angel Guerrero **1103**

**Valorization of Essential Oils from Moroccan Aromatic Plants**
Omar Santana, María Fe Andrés, Jesús Sanz, Naima Errahmani, Lamiri Abdeslam and Azucena González-Coloma **1109**

**A List of and Some Comments about the Trail Pheromones of Ants**
Xim Cerdá, Louise van Oudenhove, Carlos Bernstei and Raphaël R. Boulay **1115**

---

**New Pseudoguaiane Derivatives from *Inula aschersoniana* Janka var. *aschersoniana***
Antoaneta Trendafilova, Milka Todorova, Viktoriya Genova, Pavletta Shestakova, Dimitar Dimitrov, Milka Jadranin and Slobodan Milosavljevic **1123**

**A New Sesquiterpene Glucoside from *Lysionotus pauciflorus***
Yaya Wen, Hongjian Du, Yanbei Tu, Wei Luo, Qin Li, Yanfang Li and Bing Liang **1125**

**Two New Labdane-type Diterpenes from the Wood of *Cunninghamia konishii***
Chi-I Chang, Yen-Cheng Li, Che-Yi Chao, Sheng-Yang Wang, Hsun-Shuo Chang, Louis Kuoping Chao, Chang Syun Yang and Yueh-Hsiung Kuo **1127**

**Antibacterial activity of *Taxodium ascendens* Diterpenes against Methicillin-resistant *Staphylococcus aureus***
Courtney M. Starks, Vanessa L. Norman, Russell B. Williams, Matt G. Goering, Stephanie M. Rice, Mark O'Neil-Johnson and Gary R. Eldridge **1129**

**Use of Circular Dichroism to Determine the Absolute Configuration of a Pimarane Diterpenoid from the Southern African *Sclerocroton integerrimus* (Euphorbiaceae)**
Vuyelwa J. Tembu, Moses K. Langat, Neil R. Crouch and Dulcie A. Mulholland **1131**

**Isolation and Structure Elucidation of Rebaudioside D2 from Bioconversion Reaction of Rebaudioside A to Rebaudioside D**
Indra Prakash, Cynthia Bunders, Krishna P. Devkota, Romila D. Charan, Catherine Ramirez, Maunik Parikh and Avetik Markosyan **1135**

**2-Acetoxyverecynarmin C, a New Briarane COX Inhibitory Diterpenoid from *Pennatula aculeata***
Anu Bahl, Sanjay M. Jachak, Kishneth Palaniveloo, Tulasiramanan Ramachandram, Charles S. Vairappan and Harish K. Chopra **1139**

*Continued inside backcover*