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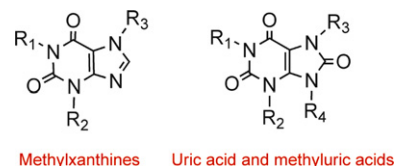
REVIEW

Caffeine and related purine alkaloids: Biosynthesis, catabolism, function and genetic engineering

pp 841–856

Hiroshi Ashihara, Hiroshi Sano, Alan Crozier*

The biosynthesis, catabolism and function of caffeine, theobromine and other purine alkaloids are reviewed. Genetic engineering studies which have produced coffee beans with a reduce caffeine content and transgenic caffeine-producing tobacco plants with enhanced disease resistance are discussed.



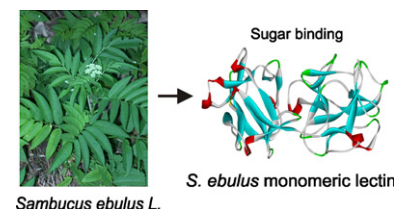
PROTEIN BIOCHEMISTRY

Transient occurrence of an ebulin-related D-galactose-lectin in shoots of *Sambucus ebulus* L.

pp 857–864

Lucía Citores, María A. Rojo, Pilar Jiménez, José M. Ferreras, Rosario Iglesias, Isabel Aranguez, Tomás Girbés*

Young shoots from *Sambucus ebulus* L. contain a D-galactose lectin which displays 80% and 45% of amino acid sequence homology with the B-chain of the ribosome-inactivating proteins ebulin I and ricin, respectively. SELIm, like ebulin and unlike ricin, binds to D-galactose-containing matrix at 0 and 10 °C but not at 20 °C.



Proteins related to St. John's Wort p27^{SJ}, a suppressor of HIV-1 expression, are ubiquitous in plants

pp 865–872

Tekla Perera, Anne Berna, Ken Scott, Christelle Lemaitre-Guillier, François Bernier*

A St. John's Wort protein related to animal DING proteins suppresses HIV-1 expression. DING proteins were purified from various plant species. They all correspond to 40 kDa mature proteins harboring the typical DINGGG-N-terminus. DING proteins are secreted and their association with the cell wall varies according to the conditions.

DINGGGATLPQaLYQTSGVLTAGFAPYI
DINGGGATLPQkLYQTSGVLTArFAPYI
DINGGGATLPQpLYQTSGVLTAGFAPYI
DINGGGATLPQkLY1Tp dVLTAGFAPYI

Characterisation of secreted polysaccharides and (glyco)proteins from suspension cultures of *Pyrus communis*

pp 873–881

Judith M. Webster, David Oxley, Filomena A. Pettolino, Antony Bacic*

Three major and two minor polysaccharides were identified from the extracellular polymers (ECP) of cell suspension cultures of *Pyrus communis*: (fucogalacto)xyloglucan (36%), galacturonan (33%), type II arabinogalactan (an arabinogalactan-protein, 29%), acidic (glucurono)arabinoxylan (2%) and heteromannan (trace) as well as a number of stress/defense-related (glyco)proteins.



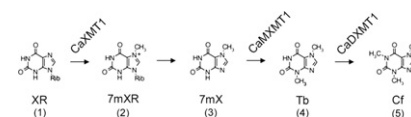
MOLECULAR GENETICS AND GENOMICS

Pathogen resistance of transgenic tobacco plants producing caffeine

pp 882–888

Yun-Soo Kim, Hiroshi Sano*

Caffeine is synthesized from xanthosine through three methylation steps by three independent *N*-methyltransferases. Using genes for these enzymes, we constructed caffeine-producing transgenic tobacco plants, which exhibited constitutive expression of disease-responsive genes and resistance against pathogen infection. Results suggested that, in addition to direct toxicity to organisms, caffeine functions as a signal molecule to activate defense systems.



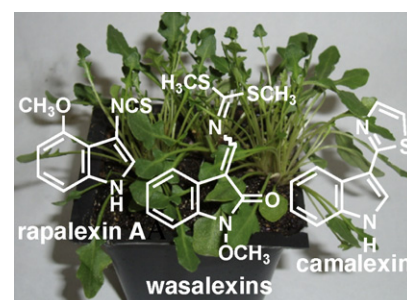
ECOLOGICAL BIOCHEMISTRY

Phytoalexins and phytoanticipins from the wild crucifers *Thellungiella halophila* and *Arabidopsis thaliana*: Rapalexin A, wasalexins and camalexin

pp 889–893

M. Soledade C. Pedras*, Adewale M. Adio

Investigation of phytoalexin production using abiotic elicitation showed that the phytoalexin rapalexin A was produced by both *Thellungiella halophila* and *Arabidopsis thaliana*, but, while *A. thaliana* produced camalexin, *T. halophila* produced wasalexins A and B and methoxybrassinin B.



Phytoalexins and polar metabolites from the oilseeds canola and rapeseed: Differential metabolic responses to the biotroph *Albugo candida* and to abiotic stress

pp 894–910

M. Soledade C. Pedras*, Qing-An Zheng, Ravi S. Gadagi, S. Roger Rimmer

The correlation observed between phytoalexin production in infected or stressed canola leaves and the outcome of the plant–pathogen interaction suggest that *Albugo candida* is able to elude the plant defense mechanisms by interfering with phytoalexin biosynthesis.



A. candida or CuCl_2
1–10 days time-course
HPLC analysis

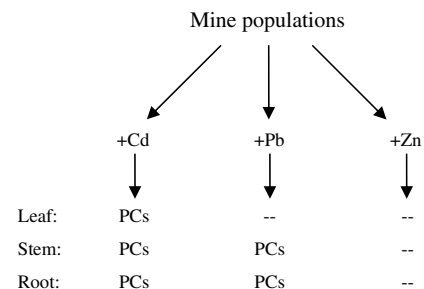
Phytoalexins, phytoanticipins
and polar metabolites

Detection of phytochelatins in the hyperaccumulator *Sedum alfredii* exposed to cadmium and lead

pp 911–918

Zhongchun Zhang, Xiang Gao, Baosheng Qiu*

Phytochelatin induction was re-examined in the leaf, stem and root tissues of the hyperaccumulator *Sedum alfredii* upon exposure to cadmium, lead and zinc. The results were shown as in the figure.



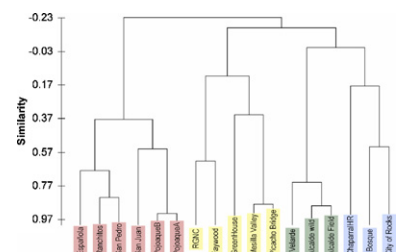
CHEMOTAXONOMY

Chemotypic variation of essential oils in the medicinal plant, *Anemopsis californica*

pp 919–927

Andrea L. Medina-Holguín, F. Omar Holguín, Sandra Micheletto, Sonda Goehle, Julian A. Simon, Mary A. O'Connell*

Three chemotypes for the medicinal plant *Anemopsis californica* were detected using a clustering analysis on the abundance of 10 essential oil components in root/rhizome extracts prepared from 17 geographically distinct populations. Growth of cervical and uterine cancer cell lines was specifically inhibited by these essential oils.

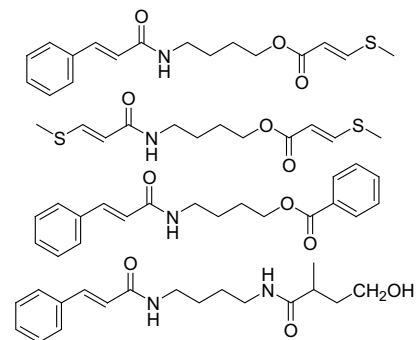


Amide-esters from *Aglaia tenuicaulis* – First representatives of a class of compounds structurally related to bisamides and flavaglines

pp 928–938

Harald Greger*, Margit Hofer, Klaus Teichmann, Johann Schinnerl, Caroline M. Pannell, Srunya Vajrodaya, Otmar Hofer*

Six amide-esters and two bisamides were isolated from *Aglaia tenuicaulis* together with two bisamides from *A. spectabilis* and their structures were elucidated by spectroscopic methods. The co-occurrence of amide-esters and bisamides suggests close biosynthetic connections with putrescine as basic skeleton linked to various acids.



BIOACTIVE PRODUCTS

The alpine violet, *Viola biflora*, is a rich source of cyclotides with potent cytotoxicity

pp 939–952

Anders Herrmann, Robert Burman, Joshua S. Mylne, Gustav Karlsson, Joachim Gullbo, David J. Craik, Richard J. Clark, Ulf Göransson*

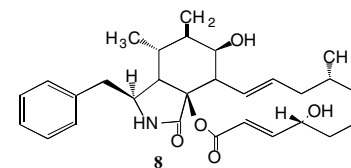
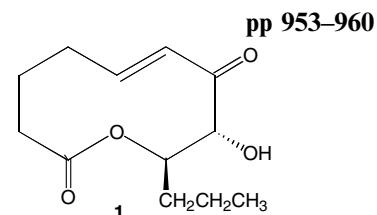
Violaceae plants are particularly rich in cyclotides, a family of cyclic and cystine knotted plant proteins. In this work, 11 cyclotides were identified by combining MS/MS sequencing and screening of a cDNA library from *Viola biflora* L., and three out of four highly abundant cyclotides showed potent cytotoxic activity.



Nonenolides and cytochalasins with phytotoxic activity against *Cirsium arvense* and *Sonchus arvensis*: A structure–activity relationships study

Alexander Berestetskiy, Andrey Dmitriev, Galina Mitina, Iosif Lisker, Anna Andolfi, Antonio Evidente*

We report the result of a structure–activity relationships study on nonenolides and cytochalasins and some their derivatives on the phytotoxicity against *Cirsium arvense* and *Sonchus arvensis*. Stagonolide (**1**) and cytochalasins B (**8**) appear to be the most toxic compound.

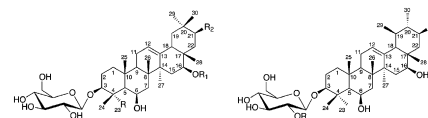


Triterpene saponins from *Silphium radula*

pp 961–972

Lalita M. Calabria*, Sonia Piacente, Ireneusz Kapusta, Suranganie F. Dharmawardhane, Frances M. Segarra, Peter J. Pessiki, Tom J. Mabry

The isolation and structural elucidation of nine polyhydroxylated oleanene and ursene triterpene saponins from the leaves and stems of *Silphium radula* (Asteraceae) are reported. Compound **2** exhibited cytotoxicity in human breast cancer cell line MDA-MB-231 at 25 µg/ml.

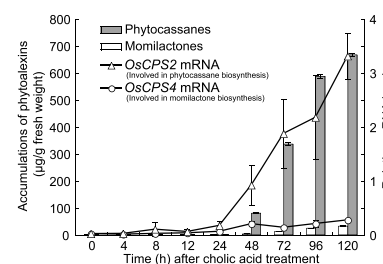


Effects of a bile acid elicitor, cholic acid, on the biosynthesis of diterpenoid phytoalexins in suspension-cultured rice cells

pp 973–981

Takafumi Shimizu, Yusuke Jikumaru, Atsushi Okada, Kazunori Okada, Jinichiro Koga, Kenji Umemura, Eiichi Minami, Naoto Shibuya, Morifumi Hasegawa, Osamu Kodama, Hideaki Nojiri, Hisakazu Yamane*

An HPLC–ESI–MS/MS system was established for the rapid quantification of the major rice phytoalexins, phytocassanes and momilactones. It was shown that cholic acid, an elicitor of rice defense responses, preferentially induced formation of phytocassanes and the transcription of diterpene cyclase genes, including *OsCPS2* (*OsCyc2*), that are involved in phytocassane biosynthesis in suspension-cultured rice cells.



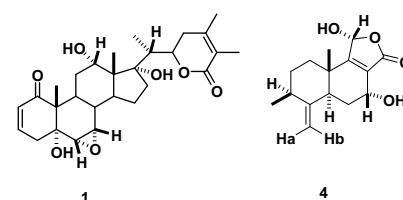
CHEMISTRY

Constituents of the stem bark of *Discopodium penninervium* and their LTB₄ and COX-1 and -2 inhibitory activities

pp 982–987

Abraham Abebe Wube, Eva-Maria Wenzig, Simon Gibbons, Kaleab Asres, Rudolf Bauer, Franz Bucar*

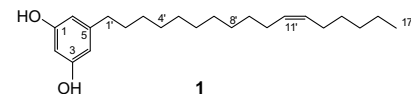
A withanolide and a sesquiterpene lactone were isolated from the stem bark of *Discopodium penninervium* and tested in vitro against LTB₄, COX-1 and -2. The withanolide (**1**) demonstrated significant inhibitory effect against LTB₄ and selectivity for COX-2 inhibition.



Anti-inflammatory 5-(11'*Z*-heptadecenyl)- and 5-(8'*Z*,11'*Z*-heptadecadienyl)-resorcinols from mango (*Mangifera indica* L.) peels**pp 988–993**

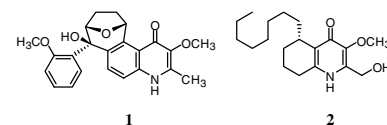
Matthias Knödler, Jürgen Conrad*, Eva M. Wenzig, Rudolf Bauer, Markus Lacorn, Uwe Beifuss, Reinhold Carle, Andreas Schieber

Bioassay-guided fractionation of mango (*Mangifera indica* L.) peels extract revealed the 5-(11'*Z*-heptadecenyl)-resorcinol (**1**) which showed potent *in vitro* anti-inflammatory activity in COX-1 and COX-2 inhibition assays.

**Quinolone alkaloids from *Waltheria douradinha*****pp 994–999**

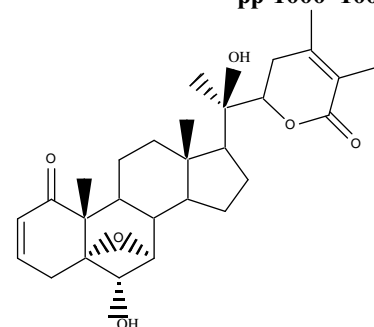
Vanessa Gressler, Caroline Z. Stüker, Gilvan de O.C. Dias, Ionara I. Dalcol, Robert A. Burrow, Juergen Schmidt, Ludger Wessjohann, Ademir F. Morel*

Investigation of *Waltheria douradinha* (Sterculiaceae) afforded quinolone alkaloids, waltherione B (**1**) and vanessine (**2**), whose structures were determined; compound **2** had weak antimicrobial activity.

**Withanolides from *Withania somnifera* roots****pp 1000–1004**

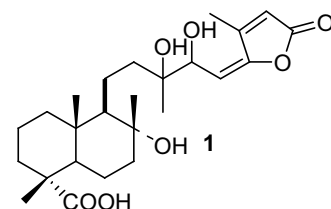
Laxminarain Misra*, Priyanka Mishra, Archana Pandey, Rajender S. Sangwan, Neelam S. Sangwan, Rakesh Tuli

Nine withasteroids have been isolated from *Withania somnifera* roots, out of which one was a 5,7 α -epoxy steroid. Their structures have been established by spectroscopic methods.

**Secondary metabolites from the aerial parts of *Salvia palaestina* Benth****pp 1005–1012**

Giuseppina Cioffi, Ammar Bader, Anna Malafronte, Fabrizio Dal Piaz, Nunziatina De Tommasi*

Three sesterterpenes (**1–3**), one triterpene (**4**) and five diterpenes (**5–9**) were isolated from the aerial parts of *Salvia palaestina*. Their structural elucidation was accomplished by extensive spectroscopic methods including 1D and 2D NMR experiments as well as ESIMS analysis and chemical analysis.

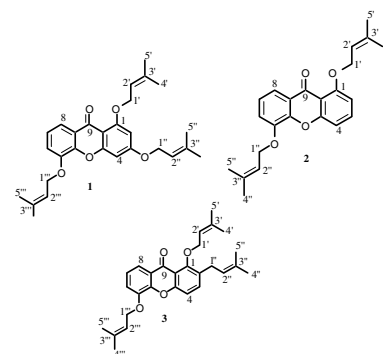


Polyanxanthone A, B and C, three xanthenes from the wood trunk of *Garcinia polyantha* Oliv.

pp 1013–1017

Gabin Nselapi Louh, Alain Meli Lannang*, Celine Djama Mbazoa, Jean Gustave Tangmouo, Justin Komguem, Paula Castilho, Fernande Ngounou Ngninzeke, Naz Qamar, David Lontsi*, Muhammad Iqbal Choudhary, Beiban Luc Sondengam

Three xanthenes, polyanxanthone A (**1**), B (**2**) and C (**3**), along with five known xanthenes were isolated from *Garcinia polyantha*. Some of the above compounds were screened for their anticholinesterase activity on acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) enzymes.

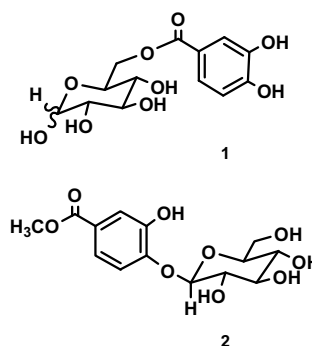


Phenolic and other constituents of fresh water fern *Salvinia molesta*

pp 1018–1023

M. Iqbal Choudhary*, Nadra Naheed, Ahmed Abbaskhan, Syed Ghulam Musharraf, Hina Siddiqui, Atta-ur-Rahman

Two glycosides, 6'-O-(3,4-dihydroxy benzoyl)- β -D-glucopyranosyl ester (**1**), and 4-O- β -D-glucopyranoside-3-hydroxy methyl benzoate (**2**), along with five known compounds **3–7**, were isolated from fresh water fern *Salvinia molesta*. These compounds showed a potent antioxidant radical scavenging activity in a non-physiological DPPH assay.

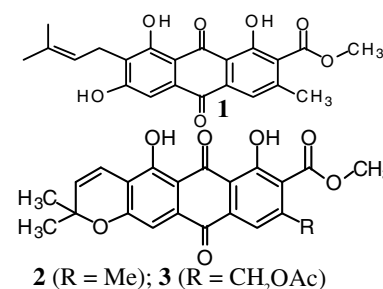


Anthraquinones from the fruits of *Vismia laurentii*

pp 1024–1028

Diderot Tchamo Nougoue*, Cyril Antheaume, Mehdi Chaabi, Bruno Lenta Ndjakou, Silvère Ngouela, Annelise Lobstein, Etienne Tsamo

Three anthraquinones were isolated from the fruits of *Vismia laurentii* (Guttiferae). They were: laurentiquinone A (**1**) (methyl 1,6,8-trihydroxy-3-methyl-7-(3-methylbut-2-enyl)-9,10-dioxo-9,10-dihydroanthracene-2-carboxylate), laurentiquinone B (**2**) (methyl 5,7-dihydroxy-2,2,9-trimethyl-6,11-dioxo-6,11-dihydro-2H-anthra[2,3-b]pyran-8-carboxylate) and laurentiquinone C (**3**) (methyl 9-(ethanoyloxymethyl)-5,7-dihydroxy-2,2-dimethyl-6,11-dioxo-6,11-dihydro-2H-anthra[2,3-b]pyran-8-carboxylate).

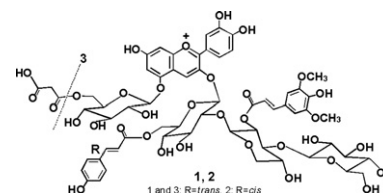


Triacylated cyanidin 3-(3^X-glucosylsambubioside)-5-glucosides from the flowers of *Malcolmia maritima*

pp 1029–1036

Fumi Tatsuzawa*, Norio Saito, Kenjiro Toki, Koichi Shinoda, Atsushi Shigihara, Toshio Honda

Three acylated cyanidin 3-(3^X-glucosylsambubioside)-5-glucosides and one non-acylated cyanidin 3-(3^X-glucosylsambubioside)-5-glucoside were isolated from the purple-violet or violet flowers and purple stems of *Malcolmia maritima* (L.) R. Br (the Cruciferae), and their structures were determined by chemical and spectroscopic methods.

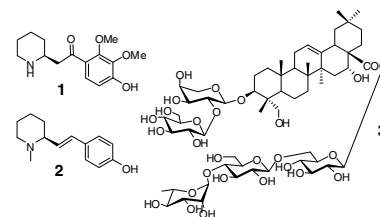


Alkaloids and saponins from blue cohosh

pp 1037–1042

Zulfiqar Ali, Ikhlas A. Khan*

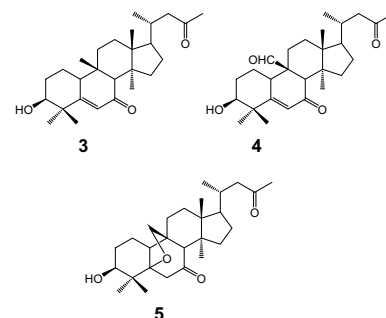
Two alkaloids, caulophyllumines A (1) and B (2), and a saponin, caulocide H (3), were isolated from blue cohosh.

Trinorcucurbitane and cucurbitane triterpenoids from the roots of *Momordica charantia*

pp 1043–1048

Jianchao Chen, Renrong Tian, Minghua Qiu*, Lu Lu, Yongtang Zheng, Zhongquan Zhang

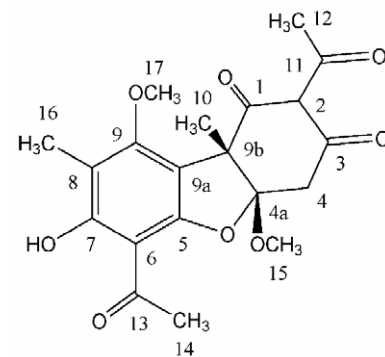
Cucurbitacins, kuguacins A–E (1–5), were isolated from the roots of *Momordica charantia* together with three known analogues. Compounds (3–5) possess an unprecedented 25,26,27-trinorcucurbitane backbone. Kuguacin C (3) showed moderate anti-HIV-1 activity with a selectivity index more than 23.68.

Purification, identification and activity of phomodione, a furandione from an endophytic *Phoma* species

pp 1049–1056

Angela M. Hoffman*, Steven G. Mayer, Gary A. Strobel, Wilford M. Hess, G. Wayne Sovocool, Andrew H. Grange, James K. Harper, Atta M. Arif, David M. Grant, Elizabeth G. Kelley-Swift

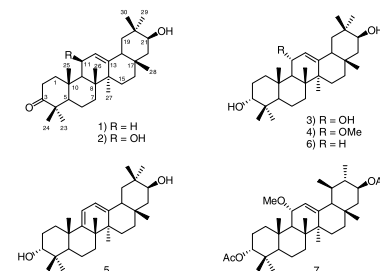
Usnic acid and two of its derivatives, cercosporamide and phomodione, were isolated from culture medium of an endophytic *Phoma* sp. Cercosporamide was characterized previously, and phomodione is shown herein to be (4a*S**,9b*R**)-2,6-diacetyl-7-hydroxy-4a,9-dimethoxy-8,9b-dimethyl-4a,9b-dihydrodibenzo[*b,d*]furan-1,3(2*H*,4*H*)-dione. Phomodione is biologically active against *Staphylococcus aureus*, *Pythium ultimum*, *Sclerotinia sclerotiorum*, and *Rhizoctonium solani*.

21β-Hydroxy-oleanane-type triterpenes from *Hippocratea excelsa*

pp 1057–1064

David Cáceres-Castillo, Gonzalo J. Mena-Rejón, Roberto Cedillo-Rivera, Leovigildo Quijano*

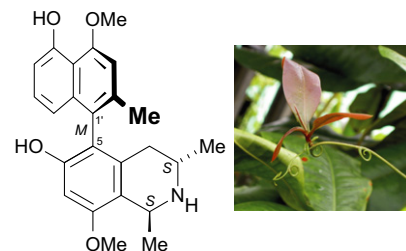
Six 21β-hydroxy pentacyclic triterpenes, five oleanane and one ursane type, were isolated from *Hippocratea excelsa*, in addition to the known 3α,21β-dihydroxy-olean-12-ene (1). Their structures were elucidated on the basis of spectroscopic analyses, including homo- and heteronuclear NMR experiments (COSY, ROESY, HSQC and HMBC) and comparison with literature data. Compounds 2–5 were assayed against *Giardia intestinalis*, but did not show antiprotozoal activity.



Six naphthylisoquinoline alkaloids and a related benzopyranone from a Congolese *Ancistrocladus* species related to *Ancistrocladus congolensis***pp 1065–1075**

Gerhard Bringmann*, Joanna Spuziak, Johan H. Faber, Tanja Gulder, Inga Kajahn, Michael Dreyer, Günther Heubl, Reto Brun, Virima Mudogo

Two 5,1'- and four 5,8'-coupled naphthylisoquinoline alkaloids were isolated from a recently discovered *Ancistrocladus* species related to *Ancistrocladus congolensis*, along with a yet unknown benzopyranone.

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* Corresponding author

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