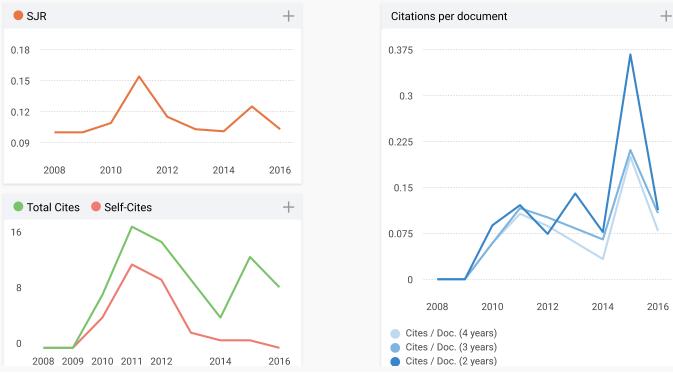
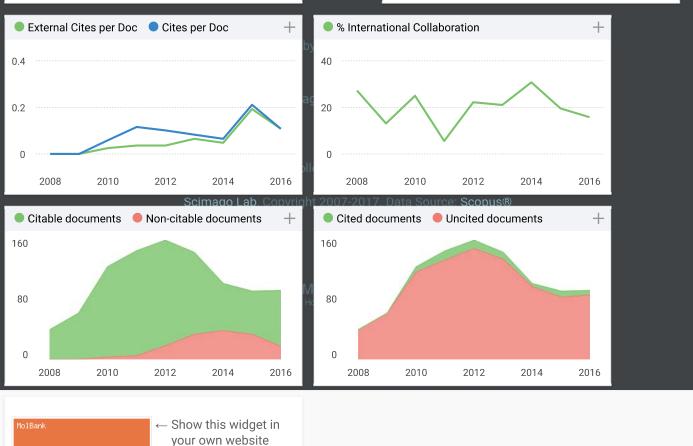
SJR Scim	ago Journal & Country	Rank	Enter Journal Ti	tle, ISSN or	Publisher Name	Q
Home	e Journal Rankings	Country Rankings	Viz Tools	Help	About Us	
		MolBan	ık ∂			
Country	Switzerland					2
Subject Area and Category	Biochemistry, Genetics Biochemistry	and Molecular Biolog	ју			
	Chemistry Organic Chemistry Physical and Theor	etical Chemistry			Н	Index
Publisher	Multidisciplinary Digital	Publishing Institute ((MDPI)			
Publication type	Journals					
ISSN	14228599					
Coverage	2007-ongoing					
Scope	•organic synthesis •bios elucidation (X-ray crysta			natural pro	duct derivatives ∙st	ructural
Quartiles					+	
Biochem	istry					
Organic Chem	istry					









Show this widget in your own website Just copy the code below

and paste within your html code:

<a href="http://www.scima

switch to desktop version (/toggle_desktop_layout_cook)/(toggle_hide_desktop_layout_option_cookie)

Menu Search

molbank (/journal/molbank)

Title / Keyword	
Author / Affiliation	
Article Type	all
Journal	Molbank
Section	all
Special Issue	all

Advanced (/search?advanced&journal=molbank)

Advanced (/search?advanced&journal=molbank)

Journal Menu

- Journal Menu
- Molbank Home (/journal/molbank)
- About this Journal (/journal/molbank/about)
- Journal Statistics (/journal/molbank/stats)
- Most Cited Articles (/journal/molbank/most_cited)
- Indexing & Abstracting (/journal/molbank/indexing)
- Instructions for Authors (/journal/molbank/instructions)
- Special Issues (/journal/molbank/special_issues)
- Article Processing Charge (/journal/molbank/apc)
- Sections (/journal/molbank/sections)
- Editorial Office (/journal/molbank/editorial_office)
- Editorial Board (/journal/molbank/editors)

E-Mail Alert

Add your e-mail address to receive forthcoming issues of this journal:

E-Mail

Journal Browser

▼ Journal Browser

volume

issue

- Forthcoming issue (/1422-8599/2017/4)
 <u>Current issue (/1422-8599/2017/3)</u>
 Vol. 2017 (/1422-8599/2017)
- Vol. 2016 (/1422-8599/2016) Vol. 2015 (/1422-8599/2015)
- Vol. 2014 (/1422-8599/2014)
- Vol. 2013 (/1422-8599/2013)
- Vol. 2012 (/1422-8599/2012)
- Vol. 2011 (/1422-8599/2011)
- Vol. 2010 (/1422-8599/2010)
- Vol. 2009 (/1422-8599/2009)
- Vol. 2008 (/1422-8599/2008)
- Vol. 2007 (/1422-8599/2007)
- Vol. 2006 (/1422-8599/2006)
- Vol. 2005 (/1422-8599/2005)
- Vol. 2004 (/1422-8599/2004)
- Vol. 2003 (/1422-8599/2003)
- Vol. 2002 (/1422-8599/2002)
 Vol. 2001 (/1422-8599/2001)
- Vol. 2000 (/1422-8599/2000)
- Vol. 1999 (/1422-8599/1999)
- Vol. 1998 (/1422-8599/1998)



MENU

Vol. 1997 (/1422-8599/1997)



(http://serve.mdpi.com/www/my_files/cliiik.php?oaparams=0bannerid=33zoneid=4cb=367943a503oadest=http%3A%2F%2Fwww.molmall.net)

Molbank - Section Editors

- Editorial Board (/journal/molbank/editors)
- <u>Section Natural Products (/journal/molbank/sectioneditors/natural_products_molbank)</u>
- Section Organic Synthesis (/journal/molbank/sectioneditors/organic_synthesis_molbank)
- <u>Section Structure Determination (/journal/molbank/sectioneditors/structure_determination_molbank)</u>

Section Board for 'Natural Products'

Please see the section webpage (/journal/molbank/sections/natural_products_molbank) for more information on this section.

Prof. Dr. Fang-Rong Chang

Graduate Institute of Natural Products, College of Pharmacy, Kaohsiung Medical University, No. 100, Shih-Chuan 1st Road, Kaohsiung, 80708, Taiwan Website (http://nphs.kmu.edu.tw/index.php/en-GB/faculty) | E-Mail ()

Interests: natural products chemistry; medicinal chemistry; transgenic plant (arabidopsis) reportor assay; epigenetic modulation for microbial secondary metabolites; functional food; ethnopharmacology

Prof. Dr. Ping-Jyun Sung

1. National Museum of Marine Biology and Aquarium, Pingtung 944, Taiwan

- 2. Graduate Institute of Marine Biology, National Dong Hwa Univesity, Pingtung 944, Taiwan
- 3. Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung 804, Taiwan
- 4. Chinese Medicine Research and Development Center, China Medical University Hospital, Taichung 404, Taiwan
- 5. Graduate Institute of Natural Products, Kaohsiung Medical University, Kaohsiung 807, Taiwan

Tel. 886-8-8825037; Fax: 886-8-8825087

Website (http://marine-natural-product-sung.weebly.com/235263951123460200272534520154.html) | E-Mail ()

Interests: marine natural products; marine chemical ecology; bioactive substances from cultured marine invertebrates

Special Issues and Collections in MDPI journals:

Special Issue: Development and Application of Herbal Medicine from Marine Origin (/journal/marinedrugs/special_issues/Herbal_Medicine_from_Marine)

Dr. Hidenori Tanaka

Oceanography Section, Science Research Center, Kochi University, 200 Otsu, Monobe, Nankoku, Kochi 783-8502, Japan <u>Website (http://www.cc.kochi-u.ac.jp/~htanaka/)</u> | <u>E-Mail ()</u> **Interests:** Organic chemistry; Carbohydrate chemistry; Natural products

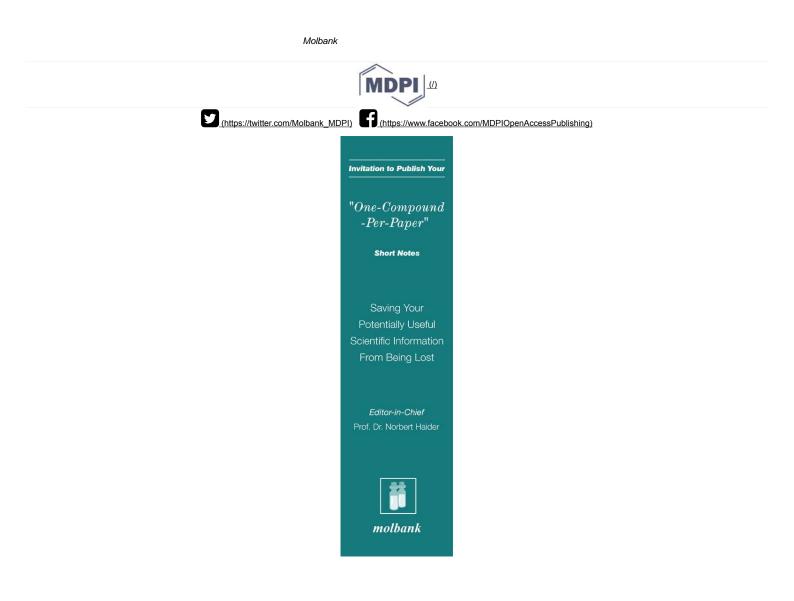
Dr. Bernd Schneider

Max Planck Institute for Chemical Ecology, Hans-Knöll-Str. 8, Beutenberg Campus, 07745 Jena, Germany <u>Website (www.ice.mpg.de)</u> | <u>E-Mail ()</u> **Interests:** natural products chemistry; chemical ecology; plant natural products; NMR of small molecules

Journal Contact

MDPI AG *Molbank* Editorial Office (/journal/molbank/editorial_office) St. Alban-Anlage 66, 4052 Basel, Switzerland E-Mail: ☑ (mailto:molbank) Tel. +41 61 683 77 34 Fax: +41 61 302 89 18 Editorial Board (/journal/molbank/editors) Contact Details (/about/contact/)

Molbank



Further Information

Article Processing Charges (/about/apc) Pay an Invoice (https://payment.mdpi.com) Open Access Policy (/about/openaccess) Terms of Use (/about/termsofuse) Terms and Conditions (/about/terms-and-conditions) Privacy Policy (/about/privacy) Contact MDPI (/about/contact) Jobs at MDPI (/about/jobs)

Guidelines

For Authors (/authors) For Reviewers (/reviewers) For Editors (/editors) For Librarians (/librarians) For Publishers (/publishing_services) For Societies (/societies)

MDPI Initiatives

Institutional Open Access Program (IOAP) (/about/ioap) Sciforum (http://sciforum.net) Preprints (http://preprints.org) Scilit (http://www.scilit.net) MDPI Books (http://books.mdpi.com) MDPI Blog (http://blog.mdpi.com/)

Molbank | Sections: Natural Products | Editorial Board

LinkedIn (https://www.linkedin.com/company/mdpi) Facebook (https://www.facebook.com/MDPIOpenAccessPublishing) Twitter (https://twitter.com/MDPIOpenAccess) Google+ (https://plus.google.com/+MdpiOA/posts)

Subscribe to receive issue release notifications and newsletters from MDPI journals

Select Journal/Journals:		
Select options	•	

Subscribe

© 1996-2017 MDPI AG (Basel, Switzerland) unless otherwise stated

switch to desktop version (/toggle_desktop_layout_cookXej/toggle_hide_desktop_layout_option_cookie)

Menu Search

MENU

Indexed in: Scopus https://y

molbank (/journal/molbank)

Title / Keyword	
Author / Affiliation	
Article Type	all
Journal	Molbank
Section	all
Special Issue	all

Advanced (/search?advanced&journal=molbank)

issue

Advanced (/search?advanced&journal=molbank)

Journal Menu

Journal Menu

- Molbank Home (/journal/molbank)
- About this Journal (/journal/molbank/about)
- Journal Statistics (/journal/molbank/stats)
- Most Cited Articles (/journal/molbank/most_cited)
- Indexing & Abstracting (/journal/molbank/indexing)
- Instructions for Authors (/journal/molbank/instructions)
- Special Issues (/journal/molbank/special_issues)
- Article Processing Charge (/journal/molbank/apc)
- Sections (/journal/molbank/sections)
- Editorial Office (/journal/molbank/editorial_office)
- Editorial Board (/journal/molbank/editors)

E-Mail Alert

Add your e-mail address to receive forthcoming issues of this journal:

E-Mail

Journal Browser

▼ Journal Browser

volume

Forthcoming issue (/1422-8599/2017/4)

- Current issue (/1422-8599/2017/3)
- Vol. 2017 (/1422-8599/2017)
 Vol. 2016 (/1422-8599/2016)
- Vol. 2015 (/1422-8599/2015)
- Vol. 2014 (/1422-8599/2014)
- Vol. 2013 (/1422-8599/2013)
- Vol. 2012 (/1422-8599/2012)
- Vol. 2011 (/1422-8599/2011)
- Vol. 2010 (/1422-8599/2010)
- Vol. 2009 (/1422-8599/2009)
- Vol. 2008 (/1422-8599/2008)
- Vol. 2007 (/1422-8599/2007)
 Vol. 2006 (/1422-8599/2006)
- Vol. 2000 (/1422-0000/2000
- Vol. 2005 (/1422-8599/2005)
 Vol. 2004 (/1422-8599/2004)
- Vol. 2003 (/1422-8599/2003)
- Vol. 2003 (/1422-8599/2003)
- Vol. 2001 (/1422-8599/2001)
- Vol. 2000 (/1422-8599/2000)
- Vol. 1999 (/1422-8599/1999)
- Vol. 1998 (/1422-8599/1998)

Rare and unique in-stock compounds orderable online at result of the store of the s

(http://serve.mdpi.com/www/my_files/cliiik.php?oaparams=0bannerid=33zoneid=4cb=0efb595493oadest=http%3A%2F%2Fwww.molmall.net)

Molbank --- Editorial Office

Journal Contact

Molbank Editorial Office MDPI AG, St. Alban-Anlage 66, 4052 Basel, Switzerland <u>E-Mail (mailto:molbank)</u> Tel. +41 61 683 77 34; Fax: +41 61 302 89 18

Mr. Gunter Li

Managing Editor MDPI Tongzhou Office, Room 2207, Jincheng Center, No. 21 Cuijingbeili, Tongzhou District, Beijing 101101, China Fax: +86 10 8152 1170 <u>E-Mail ()</u>

Franck Vazquez

Publishing Manager MDPI AG, St. Alban-Anlage 66, CH-4052 Basel, Switzerland Tel. +41 61 683 77 34; Fax. +41 61 302 89 18; <u>E-Mail (mailto:vazquez)</u>

Editorial Board (/journal/molbank/editors)

Journal Contact

MDPI AG *Molbank* Editorial Office (/journal/molbank/editorial_office) St. Alban-Anlage 66, 4052 Basel, Switzerland E-Mail: ⊠(mailto:molbank) Tel. +41 61 683 77 34 Fax: +41 61 302 89 18 Editorial Board (/journal/molbank/editors) Contact Details (/about/contact/)



Further Information

Article Processing Charges (/about/apc) Pay an Invoice (https://payment.mdpi.com) Open Access Policy (/about/openaccess) Terms of Use (/about/termsofuse) Terms and Conditions (/about/terms-and-conditions) Privacy Policy (/about/privacy) Contact MDPI (/about/contact) Jobs at MDPI (/about/jobs)

Guidelines

For Authors (/authors) For Reviewers (/reviewers) For Editors (/editors) For Librarians (/librarians) For Publishers (/publishing_services) For Societies (/societies)

MDPI Initiatives

Institutional Open Access Program (IOAP) (/about/ioap) Sciforum (http://sciforum.net) Preprints (http://preprints.org) Scilit (http://www.scilit.net) MDPI Books (http://books.mdpi.com) MDPI Blog (http://blog.mdpi.com/)

Follow MDPI

LinkedIn (https://www.linkedin.com/company/mdpi) Facebook (https://www.facebook.com/MDPIOpenAccessPublishing) Twitter (https://twitter.com/MDPIOpenAccess) Google+ (https://plus.google.com/+MdpiOA/posts)

Subscribe to receive issue release notifications and newsletters from MDPI journals

Select Journal/Journals:

Select options

Your email address here ...

Subscribe

© 1996-2017 MDPI AG (Basel, Switzerland) unless otherwise stated

Molbank | Free Full-Text | 5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-meth...

Sign In / Sign Up (/user/login) Submit (https://susy.mdpl.com/user/manuscripts/upload?journal=molbank) Search for Articles: The / Keyword Acher / Affinition		Journals (/about/journals) Inform	<u>mation (/authors)</u>	Author Services (/authors/english)	Initiatives	<u>About (/about)</u>	ৎ ≡
Tite / Keyword Autor / Affinition Culture // Autor / Issue 3.(/1422-8599/2016/3) / 10.3390/M906 Culture 2016.(/1422-8599/2016) / Issue 3.(/1422-8599/2016/3) / 10.3390/M906 Culture // Autor // Auto		Sign In / Sign Up (/user/login)	Submit (ht	ttps://susy.mdpi.com/user/man	uscripts/upload	d?journal=molba	nk)
Advbr/ / Affileston Molbank Advanced Search Advanced Search Advanced Search Unionalis (/sbout/journals// Molbank (/journal/molbank) / Volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390/M906 inolbank (/journal/molbank) Unionalis (/sbout/journals// Molbank (/journal/molbank) Submit to this Journal (https://susy.mdpi.com/user/manuscripts/upload?form%58journal_id%5D%3D11) Review for this Journal (https://susy.mdpi.com/volunteer/journals/review) Edit a Special Issue (/journalproposal/sendproposalspecialissue/molbank) Advanced Menu Abstract Abstract Share and Cite Anticle Menus Review for this Journal (https://susy.mdpi.com/volunteer/journals/review) Abstract Abstract Abstract Abstract Anticle Menu Abstract Anticle Menus Abstract Anticle Menus Abstract Abstract Anticle Menus Abs	Search	for Articles:					
Motbank Alt Article Menu Activative Menu Activ	Title / ł	Keyword					
All Article Types Advanced Search Advanced Search Unals (/about/journals) / Molbank (/journal/molbank) / Volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390/M906 i i i i i i i i i i i i i i i i i i i	Author	/ Affiliation					
Search Advanced Search pumals (/about/journals) / Molbank (/journal/molbank) / Volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390/M906 pumals (/about/journals) / Molbank (/journal/molbank) volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390/M906 Submit to this Journal (https://susy.mdpi.com/user/manuscripts/upload?form%5Bjournal_id%5D%3D11) Review for this Journal (https://susy.mdpi.com/volunteer/journals/review) Edit a Special Issue (/journalproposal/sendproposalspecialissue/molbank) Atticle Menu Abstract Share and Cite Article Merual Related Articles Supplementary Material Related Articles Supplementary Material Related Article Reprints (/1422-8599/2016/3/M906/reprints)	Molban	k					
Advanced Search Durnals (/about/journals) / Molbank (/journal/molbank) / Volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390/M906 i Olbank (/journal/molbank) Submit to this Journal (https://susy.mdpi.com/user/manuscripts/upload?form%5Bjournal_id%5D%3D11) Review for this Journal (https://susy.mdpi.com/volunteer/journals/review) Edit a Special Issue (/journalproposal/sendproposalspecialissue/molbank) Atticle Menu Abstract Share and Cite Article Merial Related Articles Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)	All Artic	le Types					
currals (/about/journals) / Molbank (/ijournal/molbank) / Volume 2016 (/1422-8599/2016) / Issue 3 (/1422-8599/2016/3) / 10.3390//M906 initian i				Search			
Edit a Special Issue (/journalproposal/sendproposalspecialissue/molbank) Article Menu Article Menu rticle Overview Abstract Share and Cite Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)							
Article Menu Article Menu Article Overview Abstract Share and Cite Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)		Submit to this Journal (http	s://susy.mdpi.com	n/user/manuscripts/upload?form%	5Bjournal_id%	5D%3D11)	
Article Menu rticle Overview Abstract Share and Cite Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)						5D%3D11)	
Abstract Share and Cite Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)		Review for	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
Share and Cite Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)		Review for Edit a Speci <u>e Menu</u>	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
Article Metrics Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)	rtic	Review for Edit a Speci <u>e Menu</u> Ie Menu	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
Supplementary Material Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)	Artic	Review for Edit a Speci <u>e Menu</u> Ie Menu rerview	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
Related Articles Order Article Reprints (/1422-8599/2016/3/M906/reprints)	Artic Micle Ov Abstr Share	Review for Edit a Speci e Menu le Menu rerview act e and Cite	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
	Article On Abstr Share Article	Review for Edit a Speci Menu Ie Menu Verview act and Cite a Metrics	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	
ticle Versions	Artic Abstr Share Article Supp	Review for Edit a Speci e Menu le Menu rerview act e and Cite e Metrics lementary Material	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	,
	Artice On Abstr Share Article Supp Relat	Review for Edit a Speci e Menu le Menu rerview act e and Cite e Metrics ementary Material ed Articles	this Journal (https	s://susy.mdpi.com/volunteer/journ	als/review)	5D%3D11)	,

Related Info Links

More by Authors Links

1236

1104

6

Downloads

Views

Citations

We use cookies on our website to ensure you get the best experience.

Read more about out, cookies here (/about/privacy). orderable online at (https://serve.mdpi.com/www/my_files/cliik.php?oaparams=0bannerid=33zoneid=4cb=bed1adb687oades

molmall.net o

²Open Access Short Note

Back to TopTop

Accept (/accept_cookies)

5 Mprll-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-∰"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one from th**m** Stem Bark of *Calophyllum pseudomole*

by mulyadi Tanjung (https://sciprofiles.com/profile/190848) 1,* 2 (mailto:please_login),

Ratih Dewi Saputri (https://sciprofiles.com/profile/257183)¹ and

Tjitjik Srie Tjahjandarie (https://sciprofiles.com/profile/159161)^{1,2} (https://orcid.org/0000-0003-0894-9803)

Natural Products Chemistry Research Group, Organic Chemistry Division, Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga, Surabaya 60115, Indonesia

Airlangga Health Science Institute, Universitas Airlangga, Surabaya 60115, Indonesia

Author to whom correspondence should be addressed.

Academic Editor: Norbert Haider

Molbank 2016, 2016(3), M906; https://doi.org/10.3390/M906 (https://doi.org/10.3390/M906)

Received: 7 July 2016 / Revised: 9 August 2016 / Accepted: 15 August 2016 / Published: 22 August 2016

(This article belongs to the Section Natural Products (/journal/molbank/sections/natural_products_molbank))

View Full-Text (/1422-8599/2016/3/M906/htm)Download PDF (/1422-8599/2016/3/M906/pdf)Browse Figure

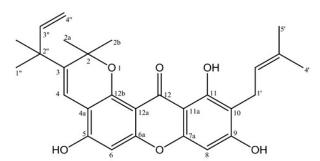
(/molbank/molbank-2016-M906/article_deploy/molbank-2016-M906-ag.jpeg)

Abstract

5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)-pyrano[2,3-a]xanthen-12(2*H*)-one (1) was isolated from the stem bark of *Calophyllum pseudomole*. The structure of 1 was established by spectroscopic analysis which included UV, IR, HRESIMS and NMR experiments. <u>View Full-Text (/1422-8599/2016/3/M906/htm</u>)

Keywords: <u>5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"butenyl)- pyrano[2,3-a]xanthen-12(2H)-one</u> (/search?q=5%2C9%2C11-trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2-butenyl%29-3-%282%E2%80%B3methyl-3%E2%80%B3butenyl%29-%20pyrano%5B2%2C3-a%5Dxanthen-12%282H%29-one); xanthone (/search?q=xanthone); Calophyllum pseudomole (/search?q=Calophyllum%20pseudomole)

▼ Show Figures



5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"butenyl)pyrano[2,3-a]xanthen-12(2H)-one

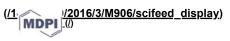
Graphical abstract

(/molbank/molbank-2016-M906/article_deploy/molbank-2016-M906-ag.jpeg)

©

This is an open access article distributed under the Creative Commons Attribution License (https://creativecommons.org/licenses//by/4.0/) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited





Share and Cite

ৎ ≡

(mailto:?&subject=From%20MDPI%3A%20%225%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80 %B2putenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29pyrano%5B2%2C3-a%5Dxanthen-12%282H%29one%20from%20the%20Stem%20Bark%20of%20Calophyllum%20pseudomole"&body=https://www.mdpi.com/152804%3A%0A %0A5%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2-butenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29pyrano%5B2%2C3-a%5Dxanthen-12%282H%29one%20from%20the%20Stem%20Bark%20of%20Calophyllum%20pseudomole%0A%0AAbstract%3A%205%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2-butenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29pyrano%5B2%2C3-a%5Dxanthen-12%282H%29-one%20%281%29 %20was%20isolated%20from%20the%20stem%20bark%20of%20Calophyllum%20pseudomole.%20The%20structure%20of%201%20was% %2C%20IR%2C%20HRESIMS%20and%20NMR%20experiments.) 1 (https://twitter.com/intent /tweet?text=%23mdpimolbank+5%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2butenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29pyrano%5B2%2C3-a%5Dxanthen-12%282H%29one+from+the+Stem+Bark+of+Calophyllum+pseudomole+https%3A%2F %2Fwww.mdpi.com%2F1422-8599%2F2016%2F3%2FM906++%40Molbank_MDPI) url=https%3A%2F%2Fwww.mdpi.com%2F152804&title=5%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2-butenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29pyrano%5B2%2C3-a%5Dxanthen-12%282H%29one%20from%20the%20Stem%20Bark%20of%20Calophyllum%20pseudomole%26source%3Dhttps%3A%2F %2Fwww.mdpi.com%26summary%3D5%2C9%2C11-Trihydroxy-2%2C2-dimethyl-10-%283%E2%80%B2-methyl-2%E2%80%B2butenyl%29-3-%282%E2%80%B3-methyl-3%E2%80%B3-butenyl%29-pyrano%5B2%2C3-a%5Dxanthen-12%282H%29-one%20%281%29 %20was%20isolated%20from%20the%20stem%20bark%20of%20Calophyllum%20pseudomole.%20The%20structure%20of%201%20was%

<u>%20%5B...%5D</u>) **f** (https://www.facebook.com/sharer.php?u=https://www.mdpi.com/152804) (https://www.reddit.com

/submit?url=https://www.mdpi.com/152804) (https://www.mendeley.com/import/?url=https://www.mdpi.com/152804)

MDPI and ACS Style

Tanjung, M.; Saputri, R.D.; Tjahjandarie, T.S. 5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one from the Stem Bark of *Calophyllum pseudomole*. *Molbank* **2016**, *2016*, M906.

Show more citation formats

() Note that from the first issue of 2016, MDPI journals use article numbers instead of page numbers. See further details <u>here</u> (<u>https://www.mdpi.com/about/announcements/784</u>).

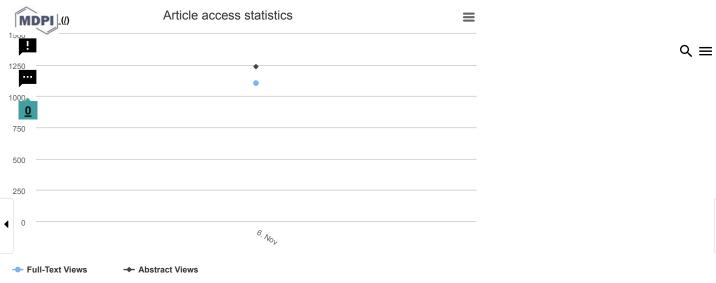
Article Metrics

Citations

Crossref	Web of Science	Scopus	Google Scholar
<u>6</u>		<u>6 (https://www.scopus.u citedby.uri?partnerID=F scp=84985955321&oriu</u>	[click to ν /scholar_lookup?title=
			author=Ratih+Dewi

Article Access Statistics

We use cookies on our website to ensure you get the best experience. Read more about our cookies <u>here (/about/privacy</u>). Molbank | Free Full-Text | 5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-meth...



For more information on the journal statistics, click here (/journal/molbank/stats).

() Multiple requests from the same IP address are counted as one view.

Supplementary Materials

Supplementary File 1: Supplementary (/1422-8599/2016/3/M906/s1) (PDF, 654 KB)

Externally hosted supplementary file 1

Doi: doi:10.3390

Link: https://www.mdpi.com (https://www.mdpi.com) Description: HRESIMS, 1H-NMR, 13C-NMR, HMQC, HMBC, UV and IR spectra are reported in the supplementary materials as Figure S1–S8

Related Articles

5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2H)-one from the Stem Bark of Calophyllum pseudomole Tanjung, Mulyadi et al., J Mar Sci Eng, 2016

5,9,11-Trihydroxy-2,2-dimethyl-3-(2-methylbut-3-en-2yl)pyrano[2,3-a]xanthen-12(2H)-one from the Stem Bark of Calophyllum tetrapterum Miq. Tjahjandarie, Tjitjik Srie et al., Molbank, 2017

Cytotoxic prenylated xanthones from the pericarps of Garcinia mangostana. Zeng Xu et al., Molecules, 2014

Xanthones and Quinolones Derivatives Produced by the Deep-Sea-Derived Fungus Penicillium sp. SCSIO Ind16F01 Liu, Feng-an et al., Molecules, 2017

Powered by TREND MD

Effect of Some Insecticides on Free Living Nitrogen Fixers and Denitrifying Bacteria $\ensuremath{\ensuremath{\mathcal{C}}}$

Nain et al., Journal of the Indian Society of Soil Science, 1984

Biotools Inks Italian Partnership GenomeWeb, 2010

116 Specific biomarkers for the exposure to organophosphate and carbamate pesticides ℤ Thomas Göen et al., Occup Environ Med, 2018

1H-NMR study of some new acetyl dimethylbiphenyls: unambiguous signal assignment for the methyl groups ℤ Kamounah, Fadhil S. et al., Spectroscopy, 1997

Molbank (/journal/molbank), EISSN 1422-8599, Published by MDPI AG

RSS (/rss/journal/molbank) Content Alert (/journal/molbank/toc-alert)

Further Information

Article Processing Charges (/apc)

Mayune in very provide the prevent of the best experience. Bead more about cookies here (/about/privacy).

Privacy Policy (/about/privacy)

Contact MDPI (/about/contact)

Accept (/accept_cookies) Back to TopTop

Ċ.

Molbank | Free Full-Text | 5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-meth...

 $Q \equiv$

DPI (/about/jobs) F //authors/ Reviewers (/reviewers) Fd Formations (/editors) For Librarians (/librarians) For ublishers (/publishing_services) For Societies (/societies) **MDPI** Initiatives Institutional Open Access Program (IOAP) (/ioap) Sciforum (https://sciforum.net) Preprints (https://www.preprints.org) Scilit (https://www.scilit.net) MDPI Books (https://www.mdpi.com/books) Encyclopedia (https://encyclopedia.pub) MDPI Blog (http://blog.mdpi.com/)

Follow MDPI

g

LinkedIn (https://www.linkedin.com/company/mdpi) Facebook (https://www.facebook.com/MDPIOpenAccessPublishing) Twitter (https://twitter.com/MDPIOpenAccess)

Subscribe to receive issue release notifications and newsletters from **MDPI** journals

Select options	•
Enter your email address	

Subscribe

© 1996-2019 MDPI (Basel, Switzerland) unless otherwise stated

Terms and Conditions (/about/terms-and-conditions) Privacy Policy (/about/privacy)

I did now initially check that there shouldn't be

We use cookies on our website to ensure you get the best experience. Read more about our cookies here (/about/privacy).



Short Note



5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3a]xanthen-12(2H)-one from the Stem Bark of *Calophyllum pseudomole*

Mulyadi Tanjung^{1,*}, Ratih Dewi Saputri¹ and Tjitjik Srie Tjahjandarie^{1,2}

- ¹ Natural Products Chemistry Research Group, Organic Chemistry Division, Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga, Surabaya 60115, Indonesia; duffputri@gmail.com (R.D.S.); tjitjiktjahjandarie@fst.unair.ac.id (T.S.T.)
- ² Airlangga Health Science Institute, Universitas Airlangga, Surabaya 60115, Indonesia
- * Correspondence: mulyadi-t@fst.unair.ac.id; Tel.: +62-31-593-6501; Fax: +62-31-593-6502

Academic Editor: Norbert Haider

Received: 7 July 2016; Accepted: 15 August 2016; Published: 22 August 2016

Abstract: 5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one (**1**) was isolated from the stem bark of *Calophyllum pseudomole*. The structure of **1** was established by spectroscopic analysis which included UV, IR, HRESIMS and NMR experiments.

Keywords: 5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one; xanthone; *Calophyllum pseudomole*

1. Introduction

The *Calophyllum* genus (Clusiaceae) comprises more than 180 species found mainly in Southeast Asia. This genus has been shown to produce a number of secondary metabolites, particularly xanthones [1–3], coumarins [4–6], chromanone acids [7–9], and flavonoids [10]. In Indonesia, the local name of *Calophyllum* is 'bitangor' [11].

Herein, we report the isolation and structural elucidation of a new isoprenylated xanthone, 5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)-pyrano[2,3-a]xanthen-12(2*H*)-one (1) (Figure 1) from the stem bark of *Calophyllum pseudomole* as well as its antioxidant activity.

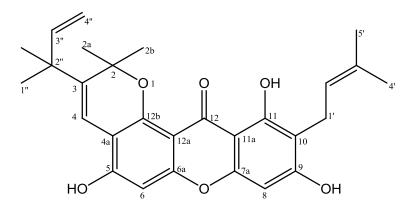


Figure 1. Structures of 5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one (**1**).

2. Result and Discussion

5,9,11-Trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3a]xanthen-12(2H)-one (1) was isolated as a yellow solid, m.p. 160–162 $^{\circ}$ C. The molecular formula of compound is $C_{28}H_{30}O_6$, whereas that of the deprotonated molecule $[M - H]^-$ is $C_{28}H_{29}O_6$ at m/z 461.1971 (calcd. 461.1964) by the HRESIMS. The UV spectrum exhibited four absorption bands characteristic of a xanthone chromophore at λ_{maks} 247, 264, 322 and 396 nm [1]. The IR spectrum showed absorption bands at v_{max} 3423, 1622, and 1460 cm⁻¹ indicating the presence of a hydroxyl, conjugated carbonyl and aromatic groups, respectively. The ¹H-NMR (Table 1) spectrum showed the presence of a chelated hydroxyl group ($\delta_{\rm H}$ 13.77, 11-OH) and two isolated aromatic proton signals at $\delta_{\rm H}$ 6.77 (1H, s, H-6) and 6.40 (1H, s, H-8) suggest that compound **1** is similar to a xanthone with six substituents [1]. The ¹H-NMR also revealed signals due to 3'-methyl-2'-butenyl group [δ_H 1.63 (3H, s, H-4'), 1.77 (3H, s, H-5'), 3.34 (2H, d, J = 7.3 Hz, H-1'), 5.27 (1H, t, J = 7.3 Hz, H-2')], ring of 2,2-dimethylpyrano monosubstituent group at $\delta_{\rm H}$ 1.49 (6H, s, H2a/H-2b), 8.19 (1H, s, H-4) and 1,1-dimethylalyl group [δ_H 1.41 (6H, s, H-1", 2"-CH₃), 5.08 (1H, dd, J = 1.1; 10.6 Hz, H-4"a), 5.16 (1H, dd, *J* = 1.1; 17.5 Hz, H-4"b), 6.02 (1H, dd, *J* = 10.6; 17.5 Hz, H-3")]. The ¹³C-NMR spectrum (Table 1) of 1, 26 carbon signals representing 28 carbon atoms were observed. The HMBC spectrum, the chelated hydroxyl group ($\delta_{\rm H}$ 13.77, 11-OH) correlated with three quaternary carbons [$\delta_{\rm C}$ 161.5 (C-11), 110.9 (C-10), 103.8 (C-11a)], and two carbons being further correlated to the isolated aromatic $(\delta_{\rm H} 6.40)$, indicating that the *para*-position of the hydroxyl group was unsubstituted. The presence of long-range correlations in the HMBC spectrum between methylen group at $\delta_{\rm H}$ 3.34 on the isoprenyl group with three aromatic carbon signals at δ_C 162.9 (C-9), 161.5 (C-11), 110.9 (C-10) and two vinyl carbon signals at δ_C 131.4 (C-3'), 118.8 (C-2'), indicated that an isoprenyl is attached at C-10 proton. Furthermore, a proton signal of an aromatic (δ_{H} 6.77, H-6) correlated with three quaternary carbons [δ_C 154.1 (C-5), 153.3 (C-6a), 108.4 (C-4a)] showed 2,2-dimethylpyrano group were fused at C-4a and C-12b. The presence of long-range correlations between vinyl group at $\delta_{\rm H}$ 8.19 the that 2,2-dimethylpyrano group with four quaternary carbons [δ_C 137.6 (C-3), 108.4 (C-4a), 80.3 (C-2), 42.7 (C-2")] showed that 1,1-dimethylalyl group attached at C-3. Therefore, compound 1, was elucidated as 5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one. Other HMBC correlations consistent with the structure **1** are shown in Table 1 and Figure 2. To our knowledge, compound 1 has not been reported previously as a novel natural product.

On antioxidant evaluation against DPPH radical scavenging, compound **1** exhibited IC₅₀ values 76 μ g/mL more active than apigenin as control positive (IC₅₀ 130 μ g/mL). Those antioxidant data suggested that compound **1** has high activity.

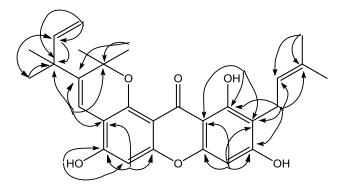


Figure 2. Selected HMBC correlations for 1.

No. C	δ _H (Mult, J Hz)	δ _C	НМВС
2	-	80.3	-
2a	1.49 (s, 3H)	27.3	C-2; C-2b
2b	1.49 (s, 3H)	27.3	C-2; C-2a
3	-	137.6	-
4	8.19 (s, 1H)	118.8	C-2; C-3; C-4a; C-2"
4a	-	108.4	-
5	-	154.1	-
6	6.77 (s, 1H)	102.9	C-4a; C-5; C-6a
6a	-	153.3	-
7a	-	155.9	-
8	6.40 (s, 1H)	93.2	C-7a; C-9; C-10; C-11a
9	-	162.9	-
10	-	110.9	-
11	-	161.5	-
11a	-	103.8	-
12	-	183.1	-
12a	-	122.8	-
12b	-	149.7	-
1'	3.34 (d, 7.3, 2H)	21.9	C-9; C-10; C-11; C-2'; C-3'
2′	5.27 (t, 7.3, 1H)	123.4	C-1'; C-4', C-5'
3'	-	131.4	-
4'	1.63 (s, 3H)	25.9	C-2'; C-3'; C-5'
5'	1.77 (s, 3H)	17.8	C-2'; C-3'; C-4'
1″	1.41 (s)	28.6	C-2"; C-3", 2"-CH ₃
2″	-	42.7	-
2"-CH ₃	1.41 (s)	28.6	C-1"; C-2", C-3"
3″	6.02 (dd, 10.6; 17.5, 1H)	147.9	C-1"; C-2"
4″	5.16 (dd, 1.1; 17.5, 1H) 5.08 (dd, 1.1; 10.6, 1H)	112.2	C-2", C-3"
11-OH	13.77 (s, 1H)	-	C-10; C-11; C-11a

Table 1. NMR spectroscopic data of 5,9,11-trihydroxy-2,2-dimethyl-10-(3'-methyl-2'-butenyl)-3-(2"-methyl-3"-butenyl)pyrano[2,3-a]xanthen-12(2*H*)-one in acetone-*d*₆.

3. Experimental Section

3.1. General

The UV spectrum was measured with Shimadzu series 1800 spectrophotometer (Kyoto, Japan). The IR spectrum was recorded with Perkin-Elmer spectrum-100 FT-IR (Waltham, MA, USA). NMR spectra were recorded on a JEOL 400 ECA spectrophotometer (Tokyo, Japan) in acetone- d_6 at 400 (¹H) and 100 (¹³C) MHz using TMS as the internal standard. The mass spectra were recorded using a Waters LCT Premier XE (Santa Clara, CA, USA). Column chromatography and radial chromatography were carried out using silica gel 60 and silica gel 60 PF₂₅₄ (Merck, Darmstadt, Germany).

3.2. Plant Material

The stem bark of *C. pseudomole* was collected in Sungai Mendawak, anak Sungai Kapuas, District Kubu Raya, Kalimantan, Indonesia on April 2015. The sample was identified and deposited in the Herbarium Bogoriense, Center of Biological Research and Development, National Institute of Science, Bogor, Indonesia.

3.3. Extraction and Isolation

The dried stem bark of *C. pseudomole* (3.0 kg) was macerated in methanol twice for 4 days, and then evaporated under reduced pressure to give a dark brown residue (120 g). Further, the methanol extract was partitioned first with *n*-hexane. The methanol extract was mixed with water (10% v/v) to increase the polarity and then partitioned with ethyl acetate. The ethyl acetate extract (24 g) was subjected to column chromatography over silica gel and eluted with *n*-hexane-ethyl acetate (from 9:1 to 3:7) to give fractions A–D. Fraction B showed the most potent antioxidant activity. Fraction B was then subjected to column chromatography and eluted with *n*-hexane-ethyl acetate (from 9:1 to 7:3) to produce subfractions B₁–B₃. Subfraction B2 was purified by planar radial chromatography using *n*-hexane-acetone (from 9:2 to 4:1) to yield compound **1** (16 mg).

3.4. DPPH Radical Scavenging

The antioxidant assay of compound **1** against DPPH (2,2-diphenyl-1-picrihidrazil) radical was measured by UV spectrometer at λ 517 nm as described previously [12–14]. The inhibition percentage (%) of radical scavenging activity was calculated using the following equation:

$$\text{Inhibition}(\%) = (A_o - A_s / A_o) \times 100 \tag{1}$$

where A_o is the absorbance of the control reaction (containing all reagents except the active compound), and A_s is the absorbance of the active compound.

Supplementary Materials: HRESIMS, ¹H-NMR, ¹³C-NMR, HMQC, HMBC, IR and UV spectra are reported in the supplementary materials at www.mdpi.com/1422-8599/2016/3/M906.

Acknowledgments: This research was supported by Directorate General of Strengthening Research and Development, Ministry of Research, Technology and Higher Education, Republic of Indonesia (Penelitian Hibah Kompetensi, Universitas Airlangga, 2016).

Author Contributions: Tjitjik Sri Tjahjandarie designed the whole experiment of bioactivity and contributed to the manuscript. Mulyadi Tanjung researched data, analyzed the NMR and HRESIMS spectra and wrote the manuscript, Ratih Dewi Saputri designed the whole experiment. All authors read and approved the final manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Ito, C.; Itoigawa, M.; Mishina, Y.; Filho, V.C.; Mukainaka, T.; Tokuda, H.; Nishino, H.; Furukawa, H. Chemical constituents of *Calophyllum brasiliensis*: Structure elucidation of seven xanthones and their cancer chemopreventive activity. *J. Nat. Prod.* 2002, 65, 267–272. [CrossRef] [PubMed]
- 2. Morel, C.; Seraphin, D.; Oger, J.M.; Litaudon, M.; Sevenet, T.; Richomme, P.; Bruneton, J. New xanthones from *Calophyllum caledonicum*. J. Nat. Prod. **2000**, 63, 1471–1474. [CrossRef] [PubMed]
- 3. Wei, D.J.; Mei, W.L.; Zhong, H.M.; Zeng, Y.B.; Wu, X.D.; Dai, H.F. A new prenylated xanthone from the branches of *Calophyllum inophyllum*. *J. Asian Nat. Prod. Res.* **2011**, *13*, 265–269. [CrossRef] [PubMed]
- 4. Joshi, S.P.; Kulkarni, S.R.; Phalgune, U.D.; Puranik, V.G. New dipyranocoumarin from the leaves of *Calophyllum apetalum* Willd. *Nat. Prod. Res.* **2013**, *27*, 1896–1901. [CrossRef] [PubMed]
- 5. Guilet, D.G.; Helesbeux, J.J.; Seraphin, D.; Sevenet, T.; Richomme, P.; Bruneton, J. Novel cytotoxic 4-phenilcoumarins from *Calophyllum dispar. J. Nat. Prod.* **2001**, *64*, 563–568. [CrossRef] [PubMed]
- Daud, S.B.; Ee, G.C.L.; Malek, E.A.; Teh, S.S.; See, I. A new coumarin from *Calophyllum hosei*. *Nat. Prod. Res.* 2014, 28, 1534–1538. [CrossRef] [PubMed]

- 7. Reyes, M.H.; Basualdo, M.C.; Abe, F.; Estrada, M.J.; Soler, C.; Chilpa, R.R. HIV-1 inhibitory compounds from *Calophyllum brasiliense* leaves. *Biol. Pharm. Bull.* **2004**, *27*, 1471–1475. [CrossRef]
- 8. Ha, L.D.; Hansen, P.E.; Duus, F.; Pham, H.D.; Nguyen, L.D. A new chromanone acid from the bark of *Calophyllum dryobalanoides*. *Phytochem. Lett.* **2012**, *5*, 287–291. [CrossRef]
- 9. Cottiglia, F.; Dhanapal, B.; Sticher, O.; Heilmann, J. New chromanone acids with antibacterial activity from the bark of *Calophyllum brasiliense*. J. Nat. Prod. 2004, 67, 537–541. [CrossRef] [PubMed]
- Ferchichi, L.; Derbre, S.; Mahmood, K.; Toure, K.; Guilet, D.; Litaudon, M.; Awang, K.; Hadi, A.H.A.; Ray, A.M.L.; Richomme, P. Bioguided fractionation and isolation of natural inhibitors of advanced glycation end-products (AGEs) from *Calophyllum flavoramulum*. *Phytochemistry* 2012, *78*, 98–106. [CrossRef] [PubMed]
- 11. Burkill, I.H. *A Dictionary of the Economic Products of the Malay Peninsula*; Goverment of Malaysia and Singapore by the Ministry of Agriculture and Co-Operatives: Kuala Lumpur, Malaysia, 1966; pp. 410–417.
- 12. Tjahjandarie, T.S.; Saputri, R.D.; Tanjung, M. Methyl 2,5-dihydroxy-4-(3'-methyl-2'-butenyl)benzoate. *Molbank* **2016**, M892. [CrossRef]
- 13. Tanjung, M.; Tjahjandarie, T.S.; Sentosa, M.H. Antioxidant and cytotoxic agent from the rhizomes of *Kaempferia pandurata. Asian Pac. J. Trop. Dis.* **2013**, *3*, 401–404. [CrossRef]
- 14. Tanjung, M.; Saputri, R.D.; Tjahjandarie, T.S. Antioxidant activity of two isomeric benzoxepin derivatives from the stem bark of *Bauhinia acuelata* L. *J. Chem. Pharm. Res.* **2014**, *6*, 705–708.



© 2016 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).