SJR Scimago Journal & Country Rank

Enter Journal Title, ISSN or Publisher Name

Home Journal Rankings Country Rankings Viz Tools Help About Us

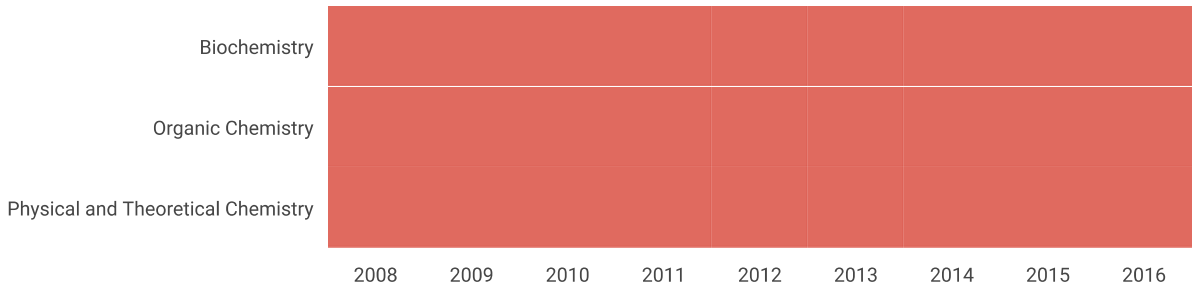
MolBank

Country	Switzerland
Subject Area and Category	Biochemistry, Genetics and Molecular Biology Biochemistry Chemistry Organic Chemistry Physical and Theoretical Chemistry
Publisher	Multidisciplinary Digital Publishing Institute (MDPI)
Publication type	Journals
ISSN	14228599
Coverage	2007-ongoing
Scope	•organic synthesis •biosynthesis •extraction and purification •natural product derivatives •structural elucidation (X-ray crystallography, NMR, etc.) (source)

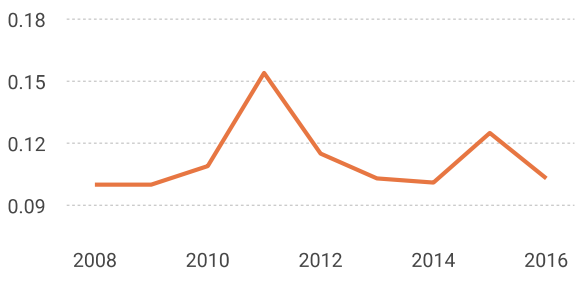
3

H Index

Quartiles

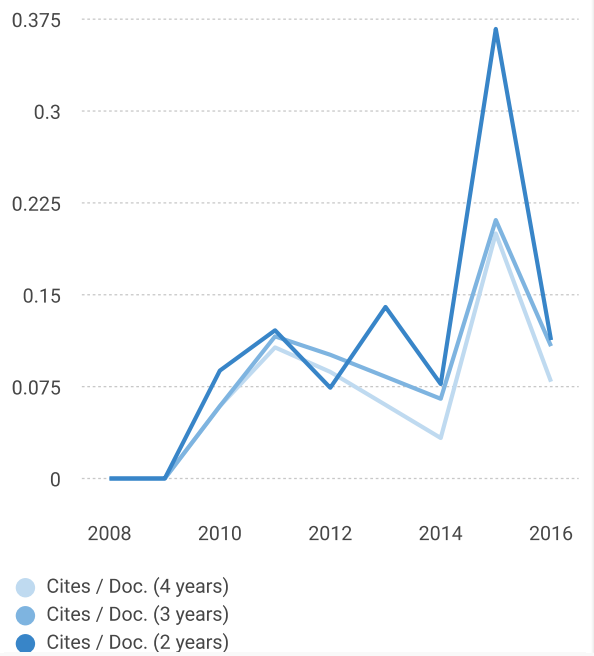


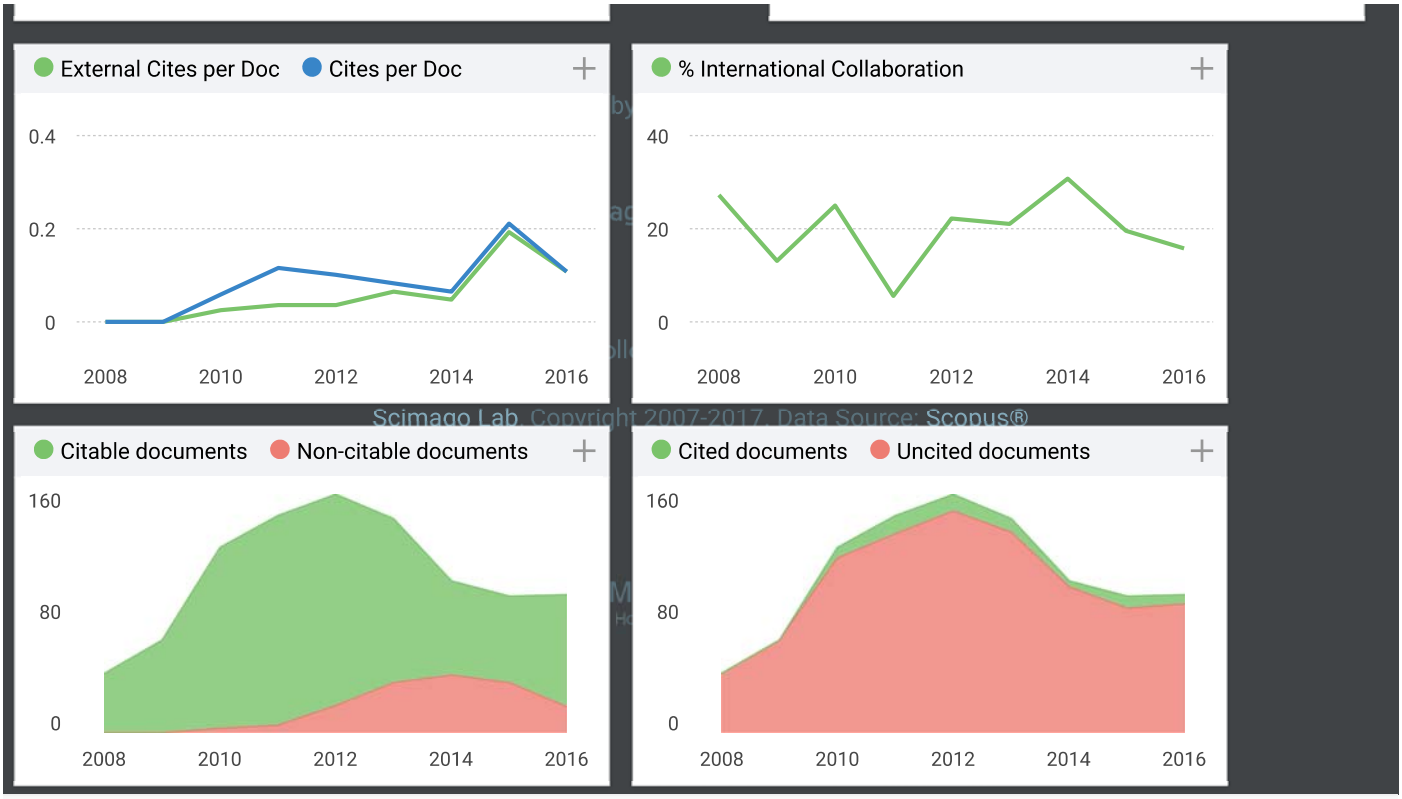
SJR

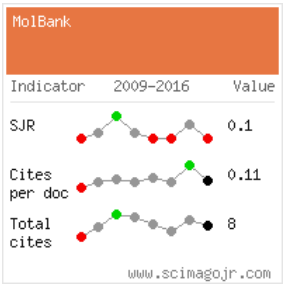


Total Cites Self-Cites

Citations per document







← 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_cookie) X (/toggle_hide_desktop_layout_option_cookie)

Menu Search

MENU

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)

Indexed in: Scopus https://w

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)
- 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. 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)

- 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)
- Section Natural Products (/journal/molbank/sectioneditors/natural_products_molbank)
- Section Organic Synthesis (/journal/molbank/sectioneditors/organic_synthesis_molbank)
- Section Structure Determination (/journal/molbank/sectioneditors/structure_determination_molbank)

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
Website (http://www.cc.kochi-u.ac.jp/~htanaka/) | E-Mail ()
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
Website (www.ice.mpg.de) | E-Mail ()
Interests: natural products chemistry; chemical ecology; plant natural products; NMR of small molecules

Journal Contact

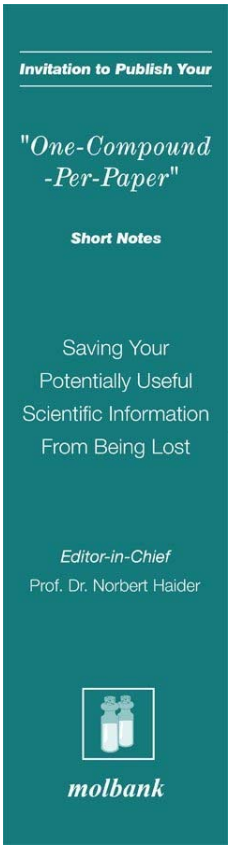
MDPI AG
Molbank Editorial Office (/journal/molbank/editorial_office)
St. Alban-Anlage 66, 4052 Basel, Switzerland
E-Mail: (mailto:molbank)
Tel. +41 61 683 77 34
Fax: +41 61 302 89 18
Editorial Board (/journal/molbank/editors)
Contact Details (/about/contact/)

Molbank

Molbank

MDPI (/)

(https://twitter.com/Molbank_MDPI) (https://www.facebook.com/MDPIOpenAccessPublishing)



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

switch to **desktop version** (/toggle_desktop_layout_cookie) X (/toggle_hide_desktop_layout_option_cookie)

Menu Search

MENU

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)

Indexed in: Scopus https://w

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)
- 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. 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)

- Vol. 1997 (/1422-8599/1997)

(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
E-Mail (mailto:molbank)
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
E-Mail ()

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;
E-Mail (mailto:vazquez)

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/)

Molbank

Molbank

MDPI (/)

(https://twitter.com/Molbank_MDPI) (https://www.facebook.com/MDPIOpenAccessPublishing)

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

MDPI (/)

Journals (/about/journals) Information (/authors) Author Services (/authors/english) Initiatives About (/about)

Sign In / Sign Up (/user/login)

Submit (https://susy.mdpi.com/user/manuscripts/upload?journal=molbank)

Search for Articles:

Title / Keyword

Author / Affiliation

Molbank

All Article Types

Search

Advanced Search

molbank (/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)

► Article Menu

Article Menu

Article Overview

- Abstract
- Share and Cite
- Article Metrics
- Supplementary Material
- Related Articles
- Order Article Reprints (/1422-8599/2017/2/M939/reprints)

Article Versions

Export Article

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

Related Links

More by Authors Links

Views 922

Downloads 1055

Citations 4

Altmetrics 1 (https://www.altmetric.com/details.php?domain=www.mdpi.com&citation_id=18582377)

(https://serve.mdpi.com/www/my_files/cliiik.php?oaparams=0bannerid=33zoneid=4cb=

Open Access Short Note

4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one from *Melicope Moluccana* T.G. Hartley

by Mulyadi Tanjung (https://sciprofiles.com/profile/190848) * (mailto:please_login),
Ratih Dewi Saputri (https://sciprofiles.com/profile/257183),
Ryan Ayub Wahjoedi (https://sciprofiles.com/profile/author/QU5kc0xWWUJ2LzE0M2N3eUtVdVptd29LSUw4dXMzbGo4
and
Tjitjik Srie Tjahjandarie (https://sciprofiles.com/profile/159161) (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

* Author to whom correspondence should be addressed.

Academic Editor: Norbert Haider

Molbank **2017**, *2017*(2), M939; https://doi.org/10.3390/M939 (https://doi.org/10.3390/M939)

Received: 16 February 2017 / Revised: 28 March 2017 / Accepted: 31 March 2017 / Published: 7 April 2017

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

View Full-Text (/1422-8599/2017/2/M939/htm) **Download PDF (/1422-8599/2017/2/M939/pdf)**

Abstract

4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (**1**) was isolated from the leaves of *Melicope moluccana* T.G. Hartley. The chemical structure of **1** was elucidated using mainly UV, IR, HRESIMS, 1D and 2D-NMR spectroscopy. View Full-Text (/1422-8599/2017/2/M939/htm)

Keywords: 4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (/search?q=4-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one); 2-quinolone alkaloid (/search?q=2-quinolone%20alkaloid); *Melicope moluccana* (/search?q=Melicope%20moluccana)

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

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

Accept (/accept_cookies)

MDPI (/) ed
Never Miss Any Articles Matching Your Research from Any Publisher
• Get alerts for new papers matching your research
• Find out the new papers from selected authors
• Updated daily for 49'000+ journals and 6000+ publishers
(/1422-8599/2017/2/M939/scifeed_display)

Share and Cite

(mailto:?&subject=From%20MDPI%3A%20%224-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one%20from%20Melicope%20Moluccana%20T.G.%20Hartley"&body=https://www.mdpi.com/190374%3A%0A%0A4-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one%20from%20Melicope%20Moluccana%20T.G.%20Hartley%0A%0AAbstract%3A%204-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one%20%281%29%20was%20isolated%20from%20the%20leaves%20of%20Melicope%20moluccana%20T.G.%20Hartley.%20The%20chemi%2C%20IR%2C%20HRESIMS%2C%201D%20and%202D-NMR%20spectroscopy.) (https://twitter.com/intent/tweet?text=%23mdpimolbank+4-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one+from+Melicope+Moluccana+T.G.+Hartley+https%3A%2F%2Fwww.mdpi.com%2F1422-8599%2F2017%2F2%2FM939++%40Molbank_MDPI) (http://www.linkedin.com/shareArticle?mini=true&url=https%3A%2F%2Fwww.mdpi.com%2F190374&title=4-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one%20from%20Melicope%20Moluccana%20T.G.%20Hartley%26source%3Dhttps%3A%2F%2Fwww.mdpi.com%26summary%3D4-Methoxy-3-%283-methylbut-2-en-1-yl%29-7-%5B%283-methylbut-2-en-1-yl%29oxy%5Dquinolin-2%281H%29-one%20%281%29%20was%20isolated%20from%20the%20leaves%20of%20Melicope%20moluccana%20T.G.%20Hartley.%20The%20chemi%2C%20IR%2C%20HRESIMS%2C%201D%20and%202D-NMR%20spectroscopy.) (https://www.facebook.com/sharer.php?u=https://www.mdpi.com/190374) (https://www.reddit.com/submit?url=https://www.mdpi.com/190374)

(https://www.mendeley.com/import/?url=https://www.mdpi.com/190374)

MDPI and ACS Style

Tanjung, M.; Saputri, R.D.; Wahjoedi, R.A.; Tjahjandarie, T.S. 4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one from *Melicope Moluccana* T.G. Hartley. *Molbank* **2017**, *2017*, M939.

Show more citation formats

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

Article Metrics

Citations

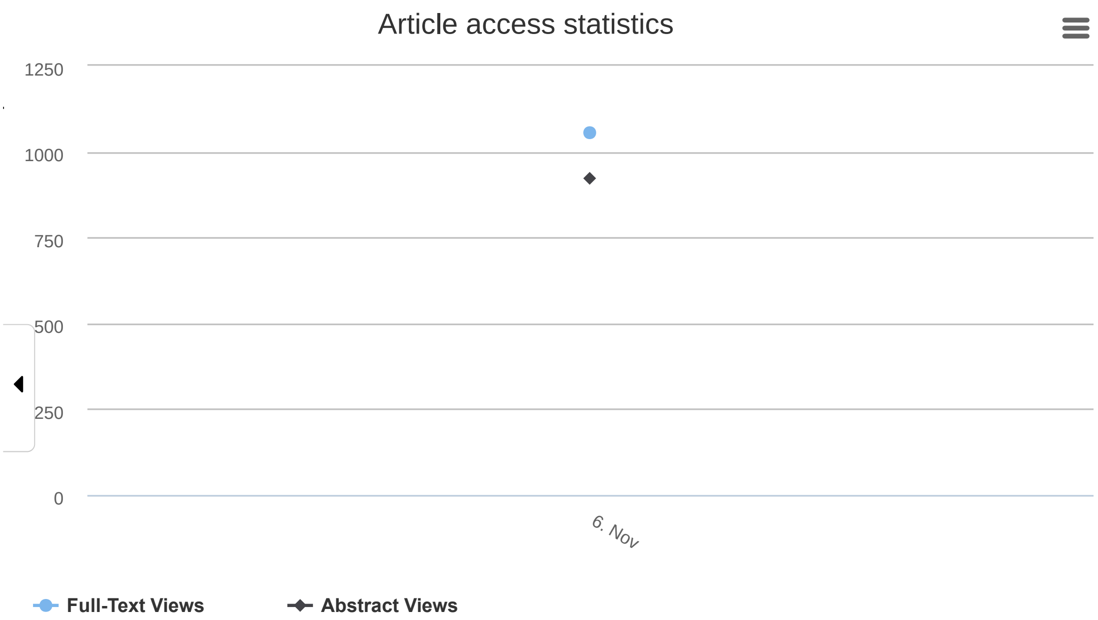
Crossref	Web of Science	Scopus	Google Scholar
4	3 (http://gateway/Gateway.cgi?GWVersion=2&SrcAuth=...&DestLinkType=Fu...&UsrCustomerID=7e7	4 (https://www.scop...246&	

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

Accept (/accept_cookies)

[...ew] (http
/...okup?tit
methylbut-2-en-1

Article Access Statistics



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:
3D structure (/1422-8599/2017/2/M939/s1) (MOL, 2 KB) **Display in MOL Viewer (/1422-8599/2017/2/M939/s1)**

3D structure generated by **CORINA (https://www.molecular-networks.com/products/corina)** by **Molecular Networks (http://www.molecular-networks.com/)**.

Supplementary File 2:
INCHI-Document (/1422-8599/2017/2/M939/s2) (INCHI, 710 B)

Supplementary File 3:
MOL-Document (/1422-8599/2017/2/M939/s3) (MOL, 2 KB) **Display in MOL Viewer (/1422-8599/2017/2/M939/s3)**

Supplementary File 4:
PDF-Document (/1422-8599/2017/2/M939/s4) (PDF, 693 KB)

Related Articles

2-Chloro-7-methyl-3-({4-[(4-nitrophenoxy)methyl]-1H-1,2,3-triazol-1-yl}methyl)quinoline
Koduru Praveena et al., Molbank, 2013

Synthesis, Structure, Chemical Stability, and In Vitro Cytotoxic Properties of Novel Quinoline-3-Carbaldehyde Hydrazones Bearing a 1,2,4-Triazole or Benzotriazole Moiety
Korcz et al., Molecules, 2018

Hydrogen-Bonding Interactions in Luminescent Quinoline-Triazoles with Dominant 1D Crystals
Bai, Shi-Qiang et al., Molecules, 2017

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

Accept (/accept_cookies)

5,9,11-Trihydroxy-2,2-dimethyl-3-(2-methylbut-3-en-2-yl)pyrano[2,3-a]xanthen-12(2H)-one from the Stem Bark

of C[illegible]um tetrapterum Miq.
Tja[illegible]Tjitjik Srie et al., Molbank, 2017

Powered by TREND MD

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)
Pay an Invoice (https://payment.mdpi.com)
Open Access Policy (/openaccess)
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) (/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

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...

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

Accept (/accept_cookies)

© 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).

Accept (/accept_cookies)

molbank

MDPI

Short Note

4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one from *Melicope Moluccana* T.G. Hartley

Mulyadi Tanjung *, Ratih Dewi Saputri, Ryan Ayub Wahjoedi and Tjitjik Srie Tjahjandarie

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.); ryanayub@rocketmail.com (R.A.W.); tjitjiktjahjandarie@fst.unair.ac.id (T.S.T.)
* Correspondence: mulyadi-t@fst.unair.ac.id; Tel.: +62-31-5936501; Fax: +62-31-5936502

Academic Editor: Norbert Haider
Received: 16 February 2017; Accepted: 31 March 2017; Published: 7 April 2017

Abstract: 4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (**1**) was isolated from the leaves of *Melicope moluccana* T.G. Hartley. The chemical structure of **1** was elucidated using mainly UV, IR, HRESIMS, 1D and 2D-NMR spectroscopy.

Keywords: 4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one; 2-quinolone alkaloid; *Melicope moluccana*

1. Introduction

Melicope is one of the genus of the family Rutaceae, consisting of about 320 species growing in the world [1]. Phytochemical studies have shown that the species produce a variety of alkaloids [2,3], flavonoids [4,5], coumarins [6], acetophenones [7], and lignans [8], which exhibit various biological activities, including antioxidant [8,9], anticancer [10,11], and antiinflammatory [12]. This study is part of our research on the chemical constituents of *Melicope* species found in Indonesia. In continuation of our research for alkaloid compounds in this medicinal plant, we report the isolation of 4-methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (**1**) from the methanol extract of the leaves of *Melicope moluccana* T.G. Hartley. The chemical structure of compound **1** were established by UV, IR, HRESIMS, 1D and 2D-NMR, and by comparison with those related compounds previously reported. Cytotoxic and antiplasmodial activities of isolated compound from this species are also briefly described.

2. Result and Discussion

The dried and powdered leaves of *M. moluccana* (2.0 kg) were extracted with methanol. The residue was partitioned with *n*-hexane. The methanol extract was then adjusted to pH 3–4 with 3% sulfuric acid and partitioned with ethyl acetate to separate the non-alkaloid compound. Acid extracts were basified with ammonia solution (pH 8–9) and partitioned with ethyl acetate to give the crude alkaloid.

The crude alkaloid (5 g) was fractionated by column chromatography on silica gel eluted with mixtures of *n*-hexane-ethyl acetate (9:1 to 1:1) to give four major fractions A–D. Fraction A (325 mg) was further separated by radial chromatography to yield two sub-fractions (A_1, A_2). Sub-fraction A_1 was purified using radial chromatography eluted with *n* hexane-chloroform (from 1:1 to 3:7) to give compound **1** (Figure 1).

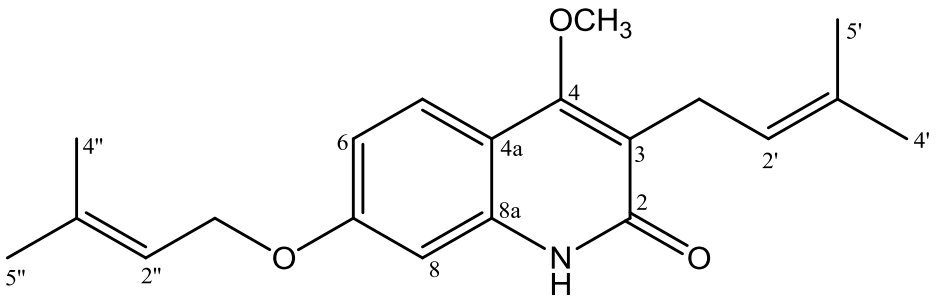


Figure 1. Structures of 4-methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one.

4-Methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (**1**) was isolated as yellow solid, reacted positively with Dragendorff reagent to give reddish brown. The HRESIMS displayed a positive molecular ion peak at m/z 328.1928, indicating a molecular formula of $C_{20}H_{26}NO_3$ (see Figure S6, supporting material). The UV spectrum exhibited absorption maxima λ_{max} (nm) (log ε): 227 (4.57), 269 (3.86), 282 (3.85), 322 (4.09), and 336 (3.98) typical for a 2-quinolone skeleton [11]. The IR spectrum (see Figure S7, supporting information) indicated absorptions for hydroxyl (3421 cm^{-1}), conjugated carbonyl (1645 cm^{-1}), aromatic (1562, 1512, 1461 cm^{-1}) and ether (1093 cm^{-1}) groups [13]. The ^{1}H NMR spectrum of **1** (Table 1, Figures S1 and S2, supporting material)) showed the presence of ABX coupling aromatic systems at δ_H 7.65 (d, J = 8.8 Hz; H-5), 7.65 (dd, J = 8.8; 2.4 Hz; H-6), and 7.05 (d, J = 2.4 Hz; H-8) characteristic for 2-quinolone with three substituents. Furthermore, the ^{1}H NMR spectrum also showed an isoprenyl (3-methyl-2-butenyl) group [δ_H 1.83 (3H, s, H-4′), 1.79 (3H, s, H-5′), 3.39 (2H, d, J = 6.8 Hz, H-1′), 5.29 (1H, t, J = 6.8 Hz, H-2′)], an oxyisoprenyl (3-methylbut-2-en-1-yl)oxy) group [δ_H 1.83 (3H, s, H-4″), 1.70 (3H, s, H-5″), 4.59 (2H, d, J = 6.8 Hz, H-1″), 5.52 (1H, t, J = 6.8 Hz, H-2″)], and a singlet proton of methoxy group at δ_H 3.93. The ^{13}C-NMR spectrum (Table 1) of **1** showed 20 carbon signals. The assignment of ^{13}C-NMR spectrum was confirmed by HMQC and HMBC spectra. The placement of isoprenyl, oxyisoprenyl, and methoxy groups in 2-quinolone skeleton was established by HMQC and HMBC spectra. Long-range correlation was observed in the HMBC spectrum of **1** between the proton signal of a methoxy group at δ_H 3.93 with an oxyaryl atom (δ_C 162.5). The methylene proton signal of an isoprenyl group at δ_H 3.39 (H-1′) showed long-range correlations with a carbonyl carbon (δ_C 166.0; C-2), a oxyaryl carbon (δ_C 162.5), two quaternary carbons (δ_C 132.2, 119.3), and a methine carbon signal (δ_C 121.8), showing a methoxy group attached at C-4. The proton signal of an aromatic region at δ_H 7.65 (H-5) showed long-range correlations with an oxyaryl carbon signals (δ_C 160.6) and a quarternary carbon (δ_C 139.1). The result revealed δ_C 160.6 has position at C-7 and δ_C 139.1 at C-8a. Furthermore, the methylene proton signal at 4.59 (H-1″) showed long-range correlations with an oxyaryl carbon (δ_C 160.6), a quarternary carbon (δ_C 139.0), and a methine carbon signal (δ_C 118.9), showing that the oxyisoprenyl group attached at C-7. See also Figure S3-S5, supporting information).

On the basis of above spectral evidence, the structure of **1** was elucidated as 4-methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one. Other HMBC correlations consistent with structure **1** are shown in Table 1 and Figure 2. The structure of **1** has not been previously reported, and it is a novel compound. On cytotoxic evaluation against P-388 cells, compound **1** exhibited IC_{50} values of 0.63 μg/mL. That cytotoxic data suggested that compound **1** has high activity. The antiplasmodial activity of **1** showed IC_{50} values of 4.28 μg/mL, which categorized as moderate activity. The data on cytotoxic and antiplasmodial activity are presented in Table 2.

Table 1. NMR spectroscopic data of 4-methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl) oxy]quinolin-2(1*H*)-one in $CDCl_3$.

No. C	δ_H (mult, *J* Hz)	δ_C	HMBC
2	-	166.0	-
3	-	119.3	-
4	-	162.5	-
4a	-	111.0	-
5	7.65 (d, 8.8)	124.2	C-7, C-8a
6	6.83 (dd, 8.8; 2.4)	112.4	C-4a, C-8
7	-	160.6	-
8	6.79 (d, 2.4)	98.8	C-4a, C-7, C-8a
8a	-	139.1	-
1′	3.39 (d, 6.8)	23.2	C-2, C-3, C-4, C-2′, C-3′
2′	5.29 (t, 6.8)	121.8	C-4′, C-5′
3′	-	132.2	-
4′	1.83 (s)	18.0	C-2′, C-3′, C-5′
5′	1.79 (s)	25.7	C-2′, C-3′, C-4′
1′′	4.59 (d, 6.8)	65.1	C-7, C-2′′, C-3′′
2′′	5.52 (t, 6.8)	118.9	C-4′′, C-5′′
3′′	-	139.0	-
4′′	1.83 (s)	18.3	C-2′′, C-3′′, C-5′′
5′′	1.70 (s)	25.9	C-2′′, C-3′′, C-4′′
4-OCH_3	3.93 (s)	61.8	C-4
NH	11.29 (s)	-	-

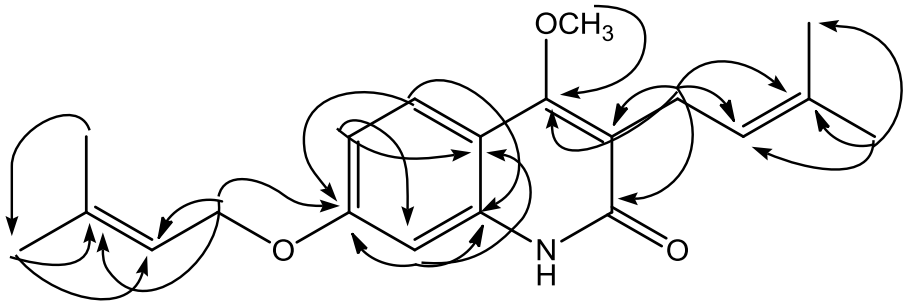


Figure 2. Selected HMBC correlations for **1**.

Table 2. Cytotoxic analysis against P-388 cells and antiplasmodial activity of compound **1**.

Compound	(IC50, μg/mL)	
	Cytotoxic Activity (P-388 Cells)	Antiplasmodial
4-methoxy-3-(3-methylbut-2-en-1-yl)-7-[(3-methylbut-2-en-1-yl)oxy]quinolin-2(1*H*)-one (**1**)	0.63	4.28
Artonin E	1.33	
Chloroquine		1.03

3. Experimental Section

3.1. General

The UV and IR spectra were measured with a Shimadzu 1800 spectrophotometer (Kyoto, Japan) and Perkin Elmer Spectrum One FTIR spectrophotometer (Waltham, MA, USA). NMR spectra were recorded on a JEOL ECA 400 spectrometer (Tokyo, Japan) in $CDCl_3$ at 400 (^{1}H) and 100 (^{13}C) 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 Si gel 60 G 1.07734.1000 and Si gel 60 PF_{254} 1.07749.1000 (Merck, Darmstadt, Germany).

3.2. Plant Material

The leaves of *M. moluccana* T.G. Hartley were collected in July 2015 from the conserved forest of Weda, Central Halmahera, North Maluku, Indonesia. The plant was identified at the Herbarium Bogoriense, and a voucher specimen number 46889 was deposited in the Bogor Botanical Garden, Bogor, Indonesia.

3.3. Extraction and Isolation

The dried and powdered leaves of *M. moluccana* T.G. Hartley (2.0 kg) were macerated in methanol at room temperature for 24 h two times, and the methanol extract was evaporated under reduced pressure to give methanol extract with dark brown residue (108 g). The methanol extract was partitioned with *n*-hexane (1:1 *v*/*v*) and then evaporated by rotavapor to give *n*-hexane extract (15 g). To the methanol extract was then added 3% sulfuric acid and adjusted to pH 3–4. Furthermore, the acid extracts were partitioned with ethyl acetate and then evaporated by rotavapor, yielding non-alkaloid (phenolic compound) extract (8 g). The acid extracts were basified with ammonia solution and adjusted to pH 8–9 and then partitioned with ethyl acetate to give crude alkaloid. The crude alkaloid (5 g) of *M. moluccana* was separated by column chromatography on silica gel. Elution with *n*-hexane-ethyl acetate mixture by increasing amount of ethyl acetate (9:1 to 1:1) to give four major fractions A–D. On thin layer chromatographic (TLC) analysis, fraction A (325 mg) showed two major spots. Separation of fraction A using planar radial chromatography and eluted with *n*-hexane-acetone mixture (from 9:1 to 7:3) to give two subfractions (A_1, A_2). Purification of subfraction A_1 by planar radial chromatography with eluent *n*-hexane-chloroform (from 1:1 to 3:7) yielded compound **1** (14 mg).

3.4. Cytotoxic Assay

Preliminary cytotoxic evaluation of compound **1** was carried out against murine leukemia P-388 cells according to the MTT assay, as previously described [14,15].

3.5. Antiplasmodial Analysis

The antiplasmodial activity of compound **1** was expressed by the 50% inhibitory concentrations (IC_{50}), representing the concentration of chloroquine that induced a 50% parasitaemia decrease compared to the positive control culture referred as 100% parasitaemia [16,17].

Supplementary Materials: ^{1}H-NMR, ^{13}C-NMR, HMQC, HMBC, and HRESIMS spectra are reported in the supplementary materials as Figure S1–S7 and structure refinement parameters as Table S1.

Acknowledgments: This research was funded by Universitas Airlangga, Ministry of Research, Technology and Higher Education, 2017.

Author Contributions: M.T. and T.S.T. designed the whole experiment. R.D.S. and R.A.W. executed the experiment. All authors interpreted data and prepare the manuscript in the same contribution.

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

References

1. Hartley, T.G. The genus *Melicope* (Rutaceae) in Borneo Sandakan. *Sandakanian* **1994**, 47–74.
2. Nakashima, K.; Oyama, M.; Ito, T.; Witono, J.R.; Darnaedi, D.; Tanaka, T.; Murata, T.; Iinuma, M. Melicodenines A and B, novel Diels-Alder type adduct isolated from *Melicope denhamii*. *Tetrahedron. Lett.* **2011**, *52*, 4694–4696. [CrossRef]
3. Nakashima, K.; Oyama, M.; Ito, T.; Akao, Y.; Witono, J.R.; Darnaedi, D.; Tanaka, T.; Murata, T.; Iinuma, M. Novel quinolinone alkaloids bearing a lignoid moiety and related constituents in the leaves of *Melicope denhamii*. *Tetrahedron* **2012**, *68*, 2421–2428. [CrossRef]

4. Sultana, N.; Hartley, T.G.; Waterman, P.G. Two novel prenylated flavanones from the aerial parts of *Melicope micrococca*. *Phytochemistry* **1999**, *50*, 1249–1253. [CrossRef]
5. Chung, L.Y.; Yap, K.F.; Goh, S.H.; Mustafa, M.R.; Imiyabir, Z. Muscarinic receptor binding activity of polyoxygenated flavanones from *Melicope subunifoliolata*. *Phytochemistry* **2008**, *69*, 1548–1554. [CrossRef] [PubMed]
6. O'Donnell, F.; Ramachandran, V.N.; Smyth, T.J.P.; Brooks, P. An investigation of bioactive phytochemicals in the leaves *Melicope vitiflora* by electrospray ionisation trap mass spectrometry. *Anal. Chim. Acta* **2009**, *634*, 115–120. [CrossRef] [PubMed]
7. Simonsen, H.T. Four novel geminaly dialkylated, non-aromatic acetophenone derivatives from *Melicope coodeana*. *Phytochem. Lett.* **2012**, *5*, 371–375. [CrossRef]
8. Kassim, N.K.; Rahmani, M.; Ismail, A.; Sukari, M.A.; Ee, G.C.L.; Nasir, N.M.; Awang, K. Antioxidant activity-guided separation of coumarins and lignan from *Melicope glabra* (Rutaceae). *Food Chem.* **2013**, *139*, 87–92. [CrossRef] [PubMed]
9. Oyama, M.; Nakashima, K.; Kamiya, T.; Haba, M.; Ito, T. Flavonoids isolated from the leaves of *Melicope triphylla* and their extracellular-superoxide dismutase-inducing activity. *Phytochem. Lett.* **2013**, *6*, 215–218. [CrossRef]
10. Komala, I.; Rahmani, M.; Sukari, M.A.; Ismail, H.B.M.; Ee, G.C.L.; Rahmat, A. Furoquinoline alkaloids from *Melicope bonwickii* (F.Muell) T. Hartley. *Nat. Prod. Res.* **2006**, *4*, 355–360. [CrossRef] [PubMed]
11. Chen, J.-J.; Chang, Y.-L.; Teng, C.-M.; Su, C.-C.; Chen, I.-S. Quinoline alkaloids and anti-platelet aggregation constituents from the leaves of *Melicope semecarpifolia*. *Planta Med.* **2002**, *68*, 790–793.
12. Chen, J.; Cho, J.; Hwang, T.; Chen, I. Benzoic acid derivatives, acetophenones, and anti-inflammatory constituents from *Melicope semecarpifolia*. *J. Nat. Prod.* **2008**, *71*, 71–75. [CrossRef] [PubMed]
13. 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.
14. 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]
15. Tanjung, M.; Mujahidin, D.; Hakim, E.H.; Mujahidin, D.; Darmawan, A.; Syah, Y.M. Geranylated flavonols from *Macaranga rhizinoides*. *Nat. Prod. Commun.* **2012**, *5*, 1209–1211.
16. Tjahjandarie, T.S.; Pudjiastuti, P.; Saputri, R.D.; Tanjung, M. Antimalaria and antioxidant activity of phenolic compounds isolated from *Erythrina crysta-galli* L. *J. Chem. Pharm. Res.* **2014**, *6*, 786–790.
17. 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**, *3*, M906. [CrossRef]

© 2017 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/).