



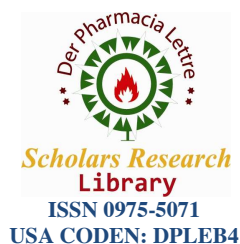
Scholars Research
Library

ISSN 0975-5071
USA CODEN: DPLEB4



Scholars Research Library

Der Pharmacia Lettre, 2015, 7 (3):149-152
(<http://scholarsresearchlibrary.com/archive.html>)



Phenolic compounds from the stem bark of *Saccopetalumhorsfieldii* Benn

Alfinda Novi Kristanti*, Nanik Siti Aminah and Mulyadi Tanjung

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

ABSTRACT

Column chromatographic separation of the methanol extract from the *Saccopetalumhorsfieldii* Benn's stem bark yielded four phenolic components including three flavonoids, kaempferol-3,4'-dimethylether(1), quercetin-3,7-dimethylether(2), quercetin-3,7,4'-trimethylether(3), and one alkaloid, lirioidenine (4). The structures of these compounds were determined based on UV, IR, HRESIMS, 1D and 2D NMR data.

Keywords: flavonoid, alkaloid, *Saccopetalumhorsfieldii* Benn, Annonaceae.

INTRODUCTION

Annonaceae is a family of plants which grows in tropical and subtropical regions. This family consists of 130 genus and more than 2000 species. In Indonesia, there are more than 20 genus. Genus which have been researched are *Annona*, *Guatteria*, *Artabotrys*, *Goniothalamus*, *Polyalthia*, *Uvaria*, *Asimia* and *Xylopi*. [1]. *Saccopetalum* is one genus that has not been much studied. There was only a small amount of research investigated the species belonged to *Saccopetalum* genus, especially *Saccopetalumhorsfieldii* Benn., a plant with a synonym name *Miliusahorsfieldii* [2].

As a result of our research for phenolic compound in this Indonesian plant, we report the isolation of phenolic compounds, kaempferol 3,4'-dimethylether(1), quercetin 3,7-dimethylether(2), quercetin 3,7,4'-trimethylether(3), and lirioidenine (4). from the methanol extract of the stem bark of *Saccopetalumhorsfieldii* Benn. The phytochemical data of this species has not been yet reported.

MATERIALS AND METHODS

General

UV and IR spectrum were measured with a Beckman DU-7500 and Perkin Elmer Spectrum FTIR Shimadzu 5300 spectrometer, respectively. ^1H and ^{13}C NMR spectrum were recorded with a JEOL 400 spectrometer operating at 400 (^1H) and 100 (^{13}C) MHz in DMSO-d_6 using TMS as the internal standard. Mass spectrum was obtained with a Waters LCT Premier XE. Vacuum liquid chromatography (VLC) and column chromatography were carried out using Si gel 60 GF₂₅₄ and Si gel 60. For TLC analysis, pre-coated silica gel plates (Merck Kieselgel 60 GF₂₅₄, 0,25 mm thickness) were used.

Plant material

The stem bark of *Saccopetalumhorsfieldii* Benn was collected from Purwodadi Botanical Garden, Center of Biological Research and Development, National Institute of Science, Pasuruan District, East Java, Indonesia.

Extraction and isolation

Milled drystem bark of *Saccopatumhorsfieldii* Benn (3.0kg) were macerated with methanol three times at room temperature, and then concentrated under reduced pressure. The residue was suspended in water and partitioned with *n*-hexane. The methanol extract was concentrated and shaken repeatedly with 5% aqueous citric acid (pH 3-4) and partitioned with dichloromethane. The dichloromethane extract (28.4 g) was fractionated on silica gel by VLC eluting with mixtures *n*-hexane-acetone (19:1, 8:1, 4:1, and 7:3) to give three major fractions A-C. Fraction B (3.6 g), purified using column chromatography eluted with mixture *n*-hexane-ethylacetate (9:1, and 4:1) to give compounds **2** (28 mg) and **3** (80 mg). Furthermore, fraction C (5.6 g) eluted with mixture *n*-hexane-acetone (9:1, 4:1 and 7:3) yielded compounds **2** (18 mg). The acid fraction was basified with 28% ammoniasolution (pH 8-9) and partitioned with ethylacetate to yield of crude alkaloids. The crude alkaloids (5.0 g) was fractionated on silica gel by column chromatography eluting with mixture *n*-hexane-chloroform (4:1 and 7:3), chloroform, and mixtures of chloroform-methanol (9:1, and 4:1) to give four major fractions A-D. Fraction D (800mg), purified using column chromatography eluted with *n*-hexane-acetone (9:1, 4:1, and 7:3), to give compounds **4** (26 mg).

Kaempferol 3,4'-dimethyl ether (1): Pale yellow solid; m.p. 237°C; UV (MeOH) λ_{\max} (nm) (log ϵ): 203 (4.68), 264 (4.28), 346 (3.80); LC-ESI-MS m/z 314[M]⁺; ¹H NMR (400 MHz, acetone-d₆) δ_{H} (ppm): 6.23 (1H, d, J = 2.4Hz, H-6), 6.47 (1H, d, J = 2.4Hz, H-8), 8.05 (2H, d, J = 9.2Hz, H-2'/6'), 7.05 (2H, d, J = 9.2Hz, H-3'/5'), 3.84 (3H, s, 3-OCH₃), 3.87 (3H, s, 4'-OCH₃), 12.75 (1H, s, 5-OH); ¹³C NMR (100 MHz, acetone-d₆) δ_{C} (ppm): 156.5 (C-2), 139.4 (C-3), 179.5 (C-4), 106.3 (C-4a), 169.0 (C-5), 97.0 (C-6), 164.8 (C-7), 94.6 (C-8), 157.8 (C-8a), 126.0 (C-1'), 131.1 (C-2'/6'), 115.3 (C-3'/5'), 162.7 (C-4'), 60.4 (3-OCH₃), 55.8 (4'-OCH₃).

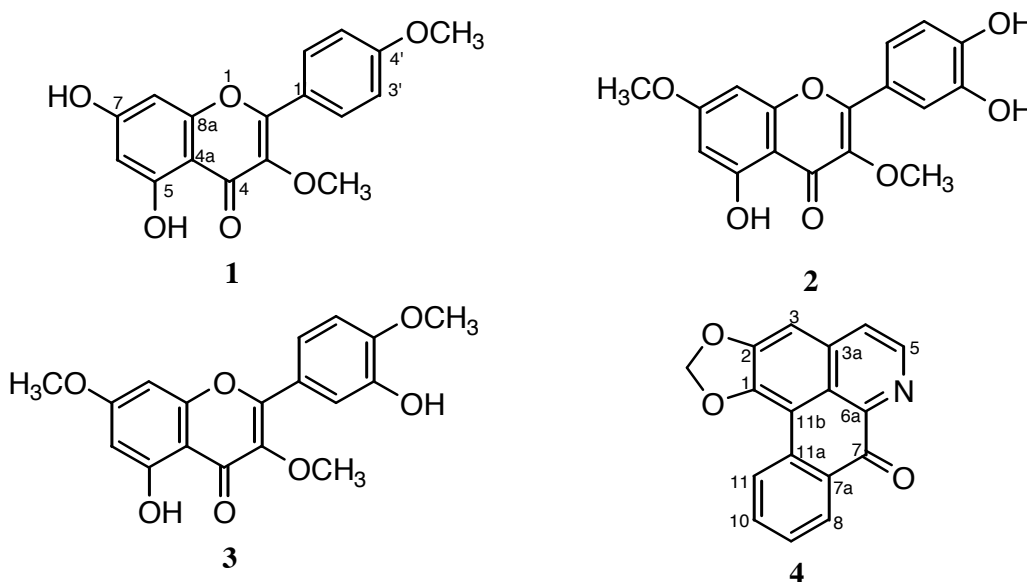


Figure 1. Structures of phenolic compounds

Quercetin 3,7-dimethyl ether (2): Pale yellow solid; m.p. 224-226°C; UV (MeOH) λ_{\max} (nm) (log ϵ): 203 (4.62), 257 (4.25), 359 (3.78); IR (KBr) ν_{\max} (cm⁻¹): 3204 (OH), 2928, 2921 (CH alkyl), 1643 (conj. C=O), and 1545, 1390 C=C aromatic). ¹H NMR (400 MHz, DMSO-d₆) δ_{H} (ppm): 6.35 (1H, d, J = 2.2Hz, H-6), 6.68 (1H, d, J = 2.2Hz, H-8), 7.58 (1H, d, J = 2.2Hz, H-2'), 6.91 (1H, d, J = 8.4Hz, H-5'), 7.47 (1H, dd, J = 8.4, 2.2Hz, H-6'), 3.80 (3H, s, 3-OCH₃), 3.86 (3H, s, 7-OCH₃), 12.67 (1H, s, 5-OH); ¹³C NMR (100 MHz, DMSO d₆) δ_{C} (ppm): 145.0 (C-2), 137.7 (C-3), 177.7 (C-4), 105.0 (C-4a), 160.7 (C-5), 95.5 (C-6), 164.8 (C-7), 92.0 (C-8), 156.0 (C-8a), 120.5 (C-1'), 115.5 (C-2'), 148.6 (C-3'), 155.7 (C-4'), 115.4 (C-5'), 120.4 (C-6'), 59.5 (3-OCH₃), 55.9 (7-OCH₃).

Quercetin 3,7,4'-trimethyl ether (3): Pale yellow solid; m.p. 173-175°C; UV (MeOH) λ_{\max} (nm) (log ϵ): 204 (4.62), 255 (4.25), 348 (3.78); IR (KBr) ν_{\max} (cm⁻¹): 3443 (OH), 1641 (conj. C=O), and 1580, 1421 C=C aromatic). ¹H NMR (400 MHz, DMSO-d₆) δ_{H} (ppm): 6.33 (1H, d, J = 2.2Hz, H-6), 6.67 (1H, d, J = 2.2Hz, H-8), 7.54 (1H, d, J = 2.0Hz, H-2'), 7.09 (1H, d, J = 8.2Hz, H-5'), 7.55 (1H, dd, J = 8.2, 2.0Hz, H-6'), 3.88 (3H, s, 3-OCH₃), 3.86 (3H, s, 7-OCH₃), 3.81 (3H, s, 4'-OCH₃), 12.61 (1H, s, 5-OH); ¹³C NMR (100 MHz, DMSO d₆) δ_{C} (ppm): 146.1 (C-2), 137.7 (C-3), 177.8 (C-4), 105.0 (C-4a), 160.7 (C-5), 97.5 (C-6), 164.8 (C-7), 92.0 (C-8), 156.0 (C-8a), 122.0 (C-1'), 115.5 (C-2'), 150.1 (C-3'), 155.3 (C-4'), 111.7 (C-5'), 120.2 (C-6'), 59.6 (3-OCH₃), 55.9 (7-OCH₃), 55.6 (4'-OCH₃).

Liriodenine(4): Pale yellow solid: UV (MeOH) λ_{\max} 272, 317nm; FAB-MS m/z 276[M+H]⁺; ¹H NMR (400 MHz, DMSO-d₆) δ_{H} (ppm): 7.58 (1H, s, H-3), 8.05 (1H, d, $J = 5.2$, H-4), 8.83 (1H, d, $J = 5.2$ Hz, H-5), 8.38 (1H, dd, $J = 8.0$, 2.0 Hz, H-8), 7.66 (1H, t, $J = 8.0$ Hz, H-9), 7.90 (1H, t, $J = 8.0$ Hz, H-10), 8.67 (1H, d, $J = 8.0$ Hz, H-11), 6.51 (2H, s, -O-CH₂-O-); ¹³C NMR (100 MHz, DMSO d₆) δ_{C} (ppm): 148.3 (C-1), 151.4 (C-2), 103.1 (C-3), 144.3 (C-3a), 124.3 (C-4), 144.2 (C-5), 135.2 (C-6a), 180.9 (C-7), 132.3 (C-7a), 126.8 (C-8), 127.6 (C-9), 133.9 (C-10), 128.3 (C-11), 130.6 (C-11a), 106.0 (C-11b), 122.4 (C-11c), 103.0 (O-CH₂-O).

RESULTS AND DISCUSSION

Four phenolic compounds, namely kaempferol 3,4'-dimethyl ether (**1**), quercetin 3,7-dimethyl ether (**2**), quercetin 3,7,4'-trimethyl ether (**3**), and liriodenine (**4**) have been isolated from the stem bark of *Saccopatum horsfieldii* Benn.

Kaempferol 3,4'-dimethyl ether (**1**) was isolated as a pale yellow solid. The UV spectrum of **1** exhibited maximum absorption on 203, 257, and 359 nm typical for a flavonol compound and showed bathochromic shifts on addition of AlCl₃ and NaOAc [3]. In the ¹³C NMR spectrum, 15 carbon signals representing 17 carbon atoms were observed. Two of them, namely the signals at δ_{C} 139.4 and 179.5, are characteristic for C-3 and C-4 of a flavonol structure [4]. The presence of five oxyaryl signals (δ_{C} 156.5, 157.8, 162.7, 164.8, and 169.0) indicated that the flavonol is a derivative of kaempferol. The ¹H NMR spectrum showed the presence of the proton signals of a pair of doublets ($J = 2.4$ Hz) in the aromatic region at δ_{H} 6.23 and 6.47 ppm, characteristic for H-6 and H-8 proton signals of the ring A. Furthermore, in the ¹H NMR spectrum, a pair of doublets ($J = 9.2$ Hz) was appeared in the aromatic region at δ_{H} 8.05 and 7.05 ppm (each 2H) characteristic for a hydroxyl phenyl group of the ring B. The ¹H NMR spectrum of **1** also showed two methoxy groups at δ_{H} 3.84 and 3.87 and a proton singlet signal at δ_{H} 12.75 that is consistent with the presence of an OH-phenolic at C-5. The placement of methoxy groups in kaempferol structure shown in HMQC and HMBC spectrum. By analysis of HMQC and HMBC spectrum of **1**, the methoxy signal (δ_{H} 3.87) exhibited ¹H-¹³C long range correlation with an oxyaryl carbon signal (δ_{C} 162.7), meanwhile correlation of the signal at δ_{H} 8.05 in the ring B correspond to the methoxy group at C-4'. Furthermore, correlation methoxyl signal δ_{H} 3.84 with δ_{C} 139.4 suggested that the methoxyl was unambiguously located at C-3. From these NMR data analysis, the flavonol isolated was assigned as kaempferol 3,4'-dimethyl ether [5]. Other HMQC and HMBC correlations, as well as ¹³C NMR data assignment, that are consistent with the structure **1** are shown in Fig. 2.

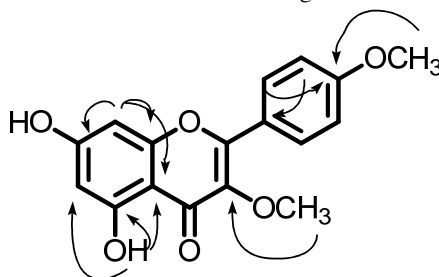


Figure 2. Significant HMBC correlation for **1**

Quercetin 3,7-dimethyl ether (**2**) was isolated as a pale yellow solid, and its UV spectrum exhibited maximum absorption on 203, 257, and 359 nm typical for a flavonol. The IR spectrum indicated absorptions for hydroxyl (3204 cm⁻¹), conjugated carbonyl (1643 cm⁻¹), and aromatic (1545, 1390 cm⁻¹) groups. The ¹H NMR spectrum of **2** showed an ABX system at δ_{H} 7.58 (d, $J = 2.2$ Hz, H-2'), 6.91 (d, $J = 8.4$ Hz, H-5'), 7.47 (dd, $J = 8.4$, 2.2 Hz, H-6') characteristic for aromatic in the ring B. The presence of the proton signals of a pair of doublets ($J = 2.2$ Hz) in the aromatic region at δ_{H} 6.35 and 6.68 ppm, characteristic for H-6 and H-8 in the ring A. The ¹H NMR spectrum of **2** also showed two methoxyl signals (δ_{H} 3.80; 3.86) and a proton singlet signal at δ_{H} 12.67 that is consistent with an OH-phenolic at C-5. The ¹³C NMR spectrum of **2** showed 17 carbon signals were observed. Two of them, namely the signals at δ_{C} 137.7 and 177.7 are characteristic for C-3 and C-4 of a flavonol structure [4]. The presence of six oxyaryl signals (δ_{C} 145.0, 148.6, 155.7, 156.0, 160.7, and 164.8) indicated that the flavonol is a derivative of quercetin. Further support for the structure **2** was also obtained from the comparison of the NMR data with those reported for quercetin 3,7-dimethyl ether from *Ericameria diffusa* [6].

Quercetin 3,7,4'-trimethyl ether (**3**) was isolated as a pale yellow solid. The UV and IR spectrum very similar with compound **2**. The ¹H NMR spectrum of **3** showed an ABX system at δ_{H} 7.54 (d, $J = 2.0$ Hz, H-2'), 7.09 (d, $J = 8.2$ Hz, H-5'), 7.55 (dd, $J = 8.2$, 2.0 Hz, H-6') and a pair of doublets ($J = 2.2$ Hz) in the aromatic region at δ_{H} 6.33 and 6.67 ppm, three methoxyl signals (δ_{H} 3.88; 3.86; 3.81) and an OH-phenolic at C-5 at δ_{H} 12.61. The ¹³C NMR spectrum of **3** showed 18 carbon signals were observed. Two of them, namely the signals at δ_{C} 137.7 and 177.8 are characteristic

flavonol structure and six oxyaryl signals (δ_C 146.1, 150.1, 155.3, 156.0, 160.7, and 164.8) indicated that the flavonol is a derivative of quercetin. The structure of **3** agreed with those recorded by Urbatsch[6].

Liriodenine(**4**) was obtained as a pale yellow solid. Its UV spectrum (λ_{max} 272, 317 nm) indicated characteristic of oxoaporphine alkaloid. The FABMS spectrum showed a molecular ion $[M+H]^+$ at m/z 276 consistent to the molecular formula $C_{17}H_{10}NO_3$. The 1H NMR spectrum of **4** showed the presence of one methylenedioxy group and seven aromatic protons. In the 1H -NMR spectrum of **4** showed a proton singlet signal of methylenedioxy signal at δ_H 6.51, a pair of doublets ($J = 5.2$ Hz) in the aromatic region at δ_H 8.05 and 8.83 are characteristic for H-4 and H-5 of an oxoaporphine structure, a proton singlet signal at δ_H 7.58 characteristic for H-3. In the aromatic region, the four aromatic protons at δ_H 8.38 (dd, $J = 8.0, 2.0$ Hz), 7.66 (t, $J = 8.0$ Hz), 7.90 (t, $J = 8.0$ Hz), 8.67 (d, $J = 8.0$ Hz) were assigned to H-8, H-9, H-10 and H-11, respectively. In the ^{13}C NMR spectrum, 17 carbon signals were observed. Two of them, the signals at δ_C 148.3 and 151.4 are characteristic for ortho oxygenated and one carbonyl group at δ_C 180.9. Based on 1H and ^{13}C NMR data were similar to those of the known compound liriodenine [7].

CONCLUSION

Three flavonoids, kaempferol 3,4'-dimethyl ether(**1**), quercetin 3,7-dimethyl ether(**2**), quercetin 3,7,4'-trimethyl ether (**3**), and alkaloid, liriodenine(**4**) have been isolated from the stem bark of *Saccopatum horsfieldii* Benn. Their structures were elucidated on the basis of spectroscopic data.

Acknowledgements

We would like to thank Purwodadi Botanical Garden, Pasuruan, Indonesia for the availability and identification of the species.

REFERENCES

- [1] E.H.Hakim; S.A.Achmad; L.Makmur; D. Mujahidin; and Syah, Y.M. *Bull. Indo. Soc. Nat. Prod. Chem.*, **2001**, 1(1), 1-12
- [2] L. Ping-tao; Gilbert, M.G., *Fl. China*, **2011**, 19, 679-681
- [3] T.J. Mabry; Markham, K.R., *Flavonoids: Chemistry, Biochemistry and Applications*, Taylor and Francis, New York, **2006**, pp. 108-109.
- [4] M. Tanjung; E.H. Hakim; Elfahmi; J. Latief; Syah, Y.M., *J Nat. Prod. Comm.*, **2012**, 7(10), 1309-1310.
- [5] L.E. Urbatsch; J.D. Bacon; Mabry, T.J., *Phytochem.*, **1975**, 14, 2279-2282.
- [6] L.E. Urbatsch; T.J. Mabry; M. Miyakado; N. Ohno; Yoshioka, H., *Phytochem.*, **1976**, 15, 440-441.
- [7] J. Kunitomo; Y. Murakami; M. Oshikata; T. Sengu; M. Akasu; S.T. Lu; Chen, I.S., *Phytochem.*, **1980**, 19, 2735-2739.



Scimago Journal & Country Rank Enter Journal Title, ISSN or Publisher Name

- Home
- Journal Rankings
- Country Rankings
- Viz Tools
- Help
- About Us

Der Pharmacia Lettre

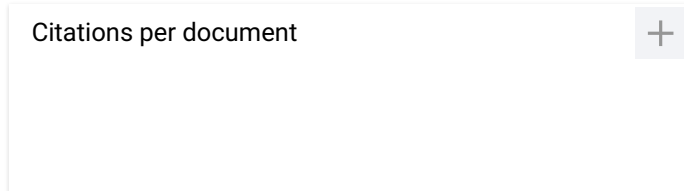
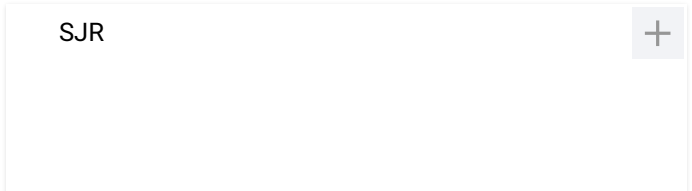
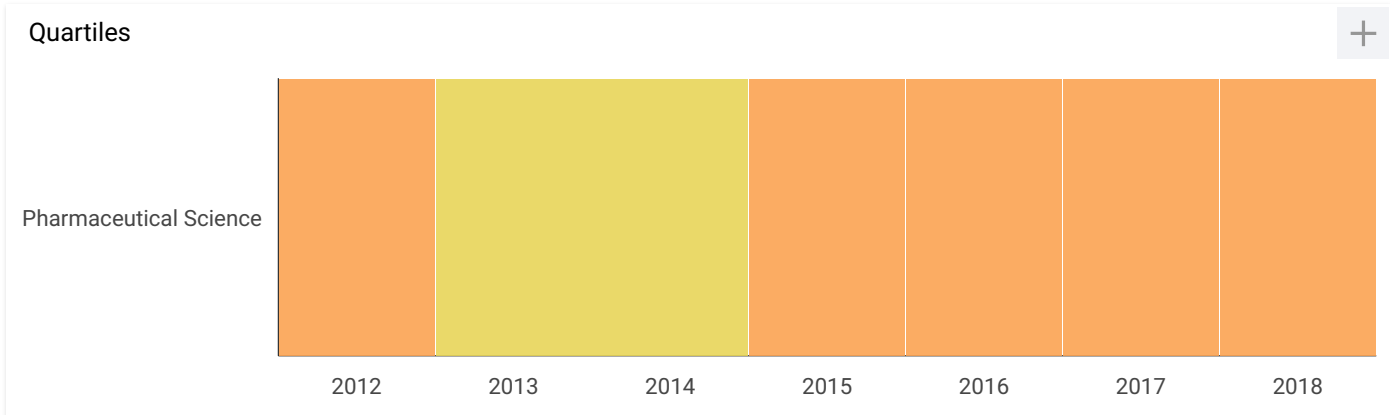
24

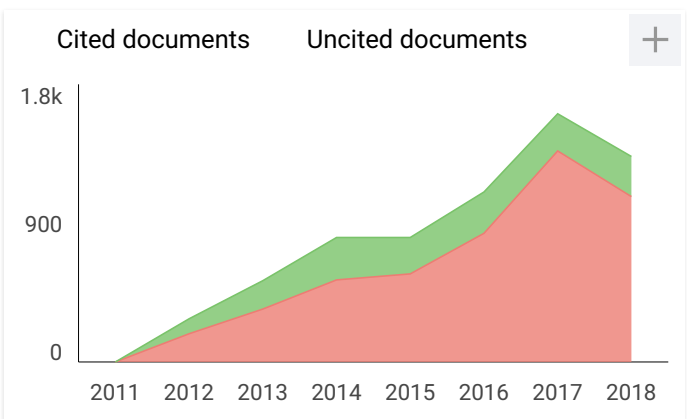
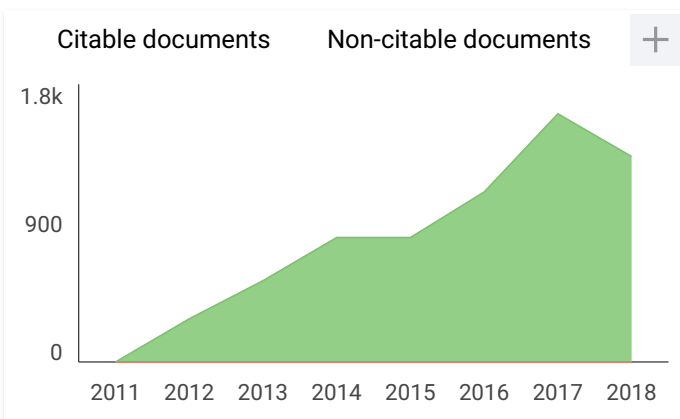
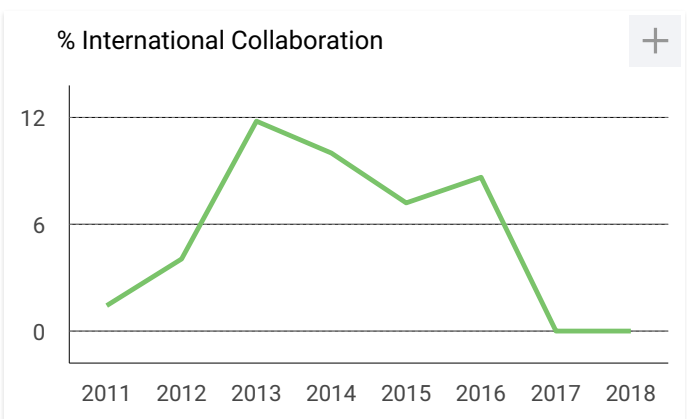
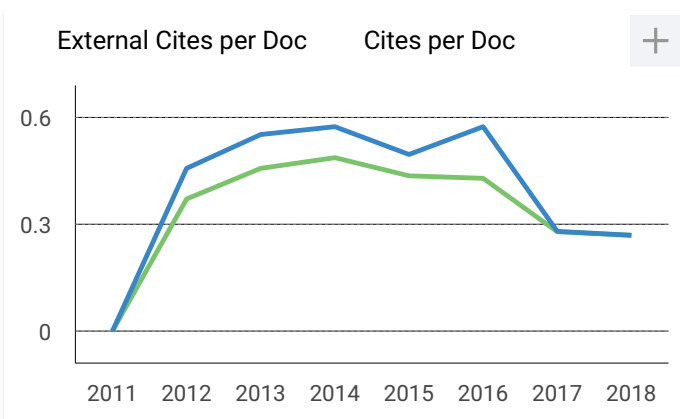
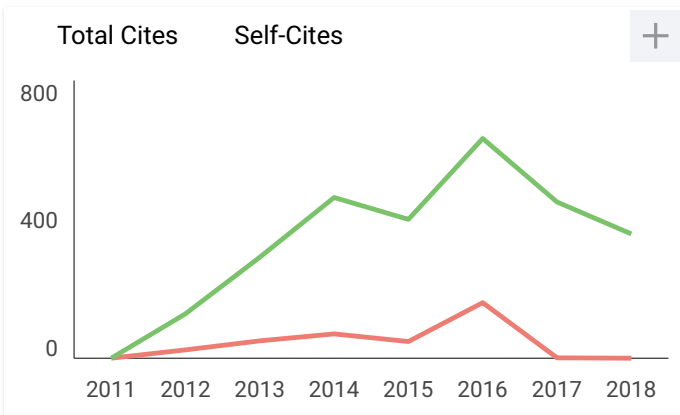
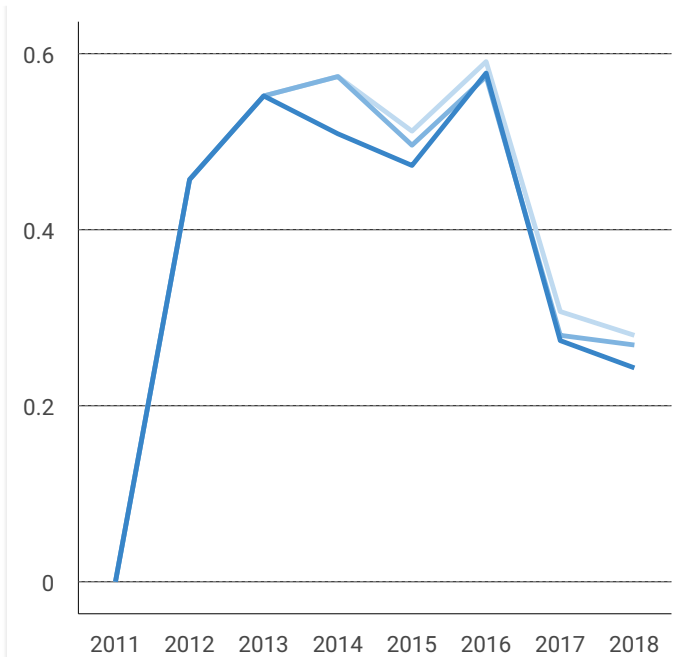
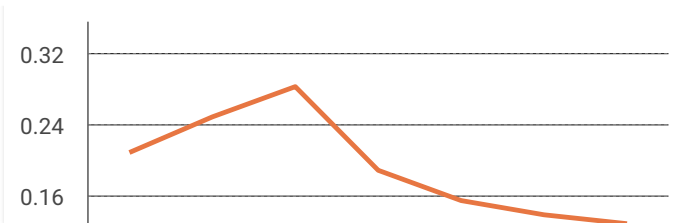
H Index

Country	United States - IIII SJR Ranking of United States
Subject Area and Category	Pharmacology, Toxicology and Pharmaceutics Pharmaceutical Science
Publisher	Scholars Research Library
Publication type	Journals
ISSN	09755071
Coverage	2011-2016 (cancelled)

Scope Der Pharmacia Lettre is an online international journal allowing access to abstracts and full-text. The journal is devoted to the promotion of all fields of pharmaceutical sciences like pharmaceutics & industrial pharmacy, pharmaceutical & medicinal chemistry, pharmacology & toxicology, phytopharmacy & medicine, hospital & clinical pharmacy, pharmacognosy & phytochemistry, pharmaceutical analysis, pharmacy practice, pharmaceutical microbiology & biotechnology including biopharmaceutics, pharmacokinetics, pharmacodynamics, computational chemistry & molecular modeling/drug design, pharmacoinformatics, chemoinformatics, pharmacogenomics and pharmacovigilance.

- [? Homepage](#)
- [How to publish in this journal](#)
- [Contact](#)
- [Join the conversation about this journal](#)





Der Pharmacia Lettre

Q3

Pharmaceutical Science

best quartile

SJR 2018

0.13

powered by scimagojr.com

← Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimagojr.com/journalsearch.php?q=19700200724&tip=sid&clean=0"
```





DER PHARMACIA LETTRE

Our Editorial Team

Editorial Board Member

Dr. Kexin Liu

Dalian Medical University, Dalian, China

Dr. Maria Stefanova Atanasova

Scientific Consulting, Chemical Engineering, University of Chemical Technology and Metallurgy, Bulgaria

Dr. Richard Zhong-ming QIAN

Chair Professor, Laboratory of Neuropharmacology, Fudan University School of Pharmacy, Shanghai 201203, PRC

Dr. ROSE ANNE VALENZUELA CHUA

National University College of Pharmacy, Philippines

Dr. VEERASWAMI B

Assistant Professor, GITAM Institute of Technology, GITAM University, Visakhapatnam, INDIA

Dr. GASMI Salim

Faculty of SESNV, Applied Biology Department, University of Tebessa, Tebessa, Algeria.

Dr. Ammar Abdul Razzak Mahmood Kubba

Department of Pharmaceutical Chemistry-University of Baghdad-Baghdad-IRAQ

Dr. Neki NS

Professor, Medicine GOVT. MEDICAL COLLEGE, AMRITSAR , PUNJAB, INDIA

Dr. Hsu-Shan Huang

Dean, School of Pharmacy, National Defense Medical Center, Taipei TAIWAN

Dr. Chenglong Li

Division of Medicinal Chemistry and Pharmacognosy College of Pharmacy, The Ohio State University, Columbus, OH USA

Dr. Teresa May Bandiola

Teresa May B. Bandiola, Professor, College of Pharmacy, National University, Manila, Philippines.

Dr. Fan-hao Meng

School of Pharmaceutical Science, China Medical University, Liaoning CHINA

Dr. Khairi Mustafa Salem F. Elbom

College of Pharmacy Al-Ain University of Science and Technology, Al Ain UAE

Dr. Mohamed A. Al-Omar

College of Pharmacy, King Saud University, Riyadh SAUDI ARABIA

Dr. Gbenga Alebiowu

Faculty of Pharmacy, Obafemi Awolowo University NIGERIA

Tweets by @DerLettre



DER PHARMACIA LETTRE

@DerLettre

Study of Microbial and Anti-microbial Properties of Palm Wine

Palm wine is a traditional alcoholic drink and act as an excellent substrate for microbial growth, which was obtained from the sap of various types of palm trees

For full length article: bit.ly/2z2307m

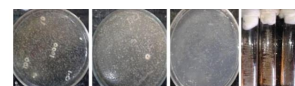


Figure 1: Inoculated substrate of yeast, lacto-acidified acetic acid bacteria, in age days.

[Embed](#)

[View on Twitter](#)

Dr. Khaled Nabih Zaki Rashed

National Research Centre (NRC), Pharmacognosy Department, Pharmaceutical and Drug Industries Research Division, Dokki, Giza, EGYPT

Dr. Guniz Kucukguzel S

Faculty of Pharmacy , Marmara University, Istanbul TURKEY

Dr. Eman Refaat Youness

Assistant Professor, National Research Center Cairo, Egypt

Dr. Zeyad Kadhem olewi

PhD in organic chemistry, University of Kufa, faculty of science



DER PHARMACIA LETTRE

2015: Volume 7, Issue 3

[Design and statistical optimization of solubility modulated monolithic osmotic tablet of metformin hydrochloride \(SCOT\)](#)

Author(s): Rashmi Sharma, Saroj Jain, Ravindra Tiwari and Kirpashanker Tiwari

Page No: 48-60 [Abstract](#) [PDF](#)

[Pharmacognostic study of Clerodendrum splendens flower and stem](#)

Author(s): Sunil B. Pandey, S. A. Nirmal and Sunil P. Pawar

Page No: 61-70 [Abstract](#) [PDF](#)

[Formulation, optimization and evaluation of oral nanosuspension tablets of nebigolol hydrochloride for enhancement of dissolution rate](#)

Author(s): Kiran Thadkala, Chintha Sailu and Jithan Aukunuru

Page No: 71-84 [Abstract](#) [PDF](#)

[Development and Validation of Rapid RP- HPLC Method for the Determination of Azathioprine in Bulk and Pharmaceutical Dosage Form](#)

Author(s): P. Ravisankar, K. Anusha Rani, C. Vineela, V. Laya Sri, M. Vijaya Bharathi

Page No: 85-95 [Abstract](#) [PDF](#)

[Kinetics and mechanism of oxidation of 4-oxo-4-phenyl butanoic acid by benzimidazolium fluorochromate in presence of 1,10-phenanthroline catalyst in acetic acid-water medium](#)

Author(s): I. Vannamuthu, V. Saleem Malik, S. Syed Shafi and S. Sheik Mansoor

Page No: 96-103 [Abstract](#) [PDF](#)

[Studies on the physicochemical properties of fenugreek \(Trigonella Foenum-Graecum L.\) seeds](#)

Author(s): Buba F., Ngura U. and Abdulrahman A. A.

Page No: 104-107 [Abstract](#) [PDF](#)

[Evaluation of anti-hyperglycemic and hypolipidemic activities of ethanolic extract of Tinospora cardifolia whole plant in alloxan induced diabetic rats](#)

Author(s): T. Naga Ravikiran, G. K. Chaitanya, K. Anoop and CH. Sri Alekhya

Page No: 108-113 [Abstract](#) [PDF](#)

[Feasibility of using natural gums for development of sustained release matrix tablet of itopride](#)

Author(s): Nandita Deb, Suresh V. Kulkarni and Ashok Kumar P.

Tweets by @DerLettre



DER PHARMACIA LETTRE

@DerLettre

Study of Microbial and Anti-microbial Properties of Palm Wine

Palm wine is a traditional alcoholic drink and act as an excellent substrate for microbial growth, which was obtained from the sap of various types of palm trees

For full length article: bit.ly/2z2307m

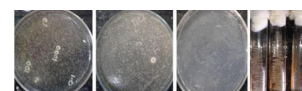


Figure 1: Substrate utilization of some bacteria and yeast with kinetics in palm wine.

[Embed](#)

[View on Twitter](#)

Page No: 114-123 [Abstract](#) [PDF](#)

[First derivative UV-spectrophotometric method for simultaneous determination of simvastatin and ezetimibe in tablet dosage form](#)

Author(s): Seema M. Dhole and Manjusha P. Yeole

Page No: 124-128 [Abstract](#) [PDF](#)

[The effect of aqueous seed extract of Moringa Oleifera on sperm count, motility and morphology in male albino wistar rats](#)

Author(s): Obembe A. O, Urom S. E., Ofutet E. O. Ikpi D. E. and Okpo-Ene A. I.

Page No: 129-133 [Abstract](#) [PDF](#)

[Hospital environment and risk of nosocomial infections in the intensive care unit of Provincial Hospital El Idrissi of Kenitra in Morocco](#)

Author(s): Rajaa Amiyare, Ikram Afifi and Mohammed Ouhssine

Page No: 134-140 [Abstract](#) [PDF](#)

[Development and evaluation of aceclofenac transdermal patches with different permeation enhancers](#)

Author(s): Mamta Yadav, Satish Nayak and Jetendra Banweer

Page No: 141-148 [Abstract](#) [PDF](#)

[Phenolic compounds from the stem bark of Saccopetalumhors fieldii Benn](#)

Author(s): Alfinda Novi Kristanti, Nanik Siti Aminah and Mulyadi Tanjung

Page No: 149-152 [Abstract](#) [PDF](#)

[Isoprenylated flavanone derivatives from Macaranga hosei King ex Hook.F.](#)

Author(s): Eva Marliana, Tjitjik Sri Tjahjandarie and Mulyadi Tanjung

Page No: 153-156 [Abstract](#) [PDF](#)

[Simultaneous determination of bromhexine hydrochloride and salbutamol sulphate in pharmaceutical dosage by reverse phase high performance liquid chromatography](#)

Author(s): Rajan V. Rele.

Page No: 157-161 [Abstract](#) [PDF](#)

[Enhancement of dissolution and bioavailability of fenofibrate by Solid Dispersion with sodium citrate, HPMC and sugar derivatives](#)

Author(s): Sanjeev Kumar, D. N. Mishra and S. K. Singh

Page No: 162-173 [Abstract](#) [PDF](#)

[Present scenario of medical food with specific emphasis on its registration procedure in US and Australia](#)

Author(s): Mansi Kavi, Krupa C. Thula and Dilip G. Maheshwari

Page No: 174-179 [Abstract](#) [PDF](#)

[A RP-HPLC method development and validation for simultaneous estimation of metformin HCl and rosiglitazone in bulk and tablet dosage form](#)

Author(s): P. Madhusudhan, M. Radhakrishna Reddy and N. Devanna

Page No: 180-187 [Abstract](#) [PDF](#)

[Regulatory requirements and different pathways for registration of drug products in united kingdam](#)

Author(s): Abdul Rasheed and Mudit Dixit

Page No: 188-195 [Abstract](#) [PDF](#)

[Antimicrobial studies on flowers of Euphorbia Milii](#)

Author(s): Devanaboyina Narendra, A. Mounisha, B.Bhavani, G.Sireesha, K.Vijaya Kamari and M. Sri Ramavenkata Reddy

Page No: 196-204 [Abstract](#) [PDF](#)

[Biosorption of Cu \(II\) from aqueous solutions: Kinetics and characterization studies](#)

Author(s): Dharmaraj Senthilkumar, Anita Sagadevan Ethiraj, Raghavan Vimala, Chidambaram Ramalingam and Sivaraman Jayanthi

Page No: 205-213 [Abstract](#) [PDF](#)

[Development and validation of analytical methods for estimation of imatinib mesylate in bulk and solid dosage forms by UV spectroscopy](#)

Author(s): Mahesh S. Wajurkar, Manjusha N. Dole and Sanjay D. Sawant

Page No: 214-220 [Abstract](#) [PDF](#)

[Development and validation of RP-HPLC method for the estimation of risperidone in bulk and pharmaceutical dosage form](#)

Author(s): B. Lakshmi, K. Rama Krishna and K. N. Jayaveera

Page No: 221-227 [Abstract](#) [PDF](#)

[Study of corrosion Moroccan's currencies piece of a dirham \(2002 type\) in 3% NaCl environnement](#)

Author(s): Hassane Elhadiri, Siham Boughaba, Mohsine Galai, El Housseine Rifi and Mohammed Cherkaoui

Page No: 228-240 [Abstract](#)

[Novel spectrophotometric methods for the determination of clopidogrel bisulphate in bulk and pharmaceutical formulations by cobalt thiocyanate and Tpoos](#)

Author(s): K. Raghu babu, D. Chandra Sekhar, N. Aruna Kumari and V. Jagannadha Rao

Page No: 241-246 [Abstract](#) [PDF](#)

[Validation of stability indicating RP-HPLC method for the assay of venlafaxine in pharmaceutical dosage form](#)

Author(s): B. Koteswara Rao, K. R. Manjula, K. Suresh Babu and C. Rambabu

Page No: 247-256 [Abstract](#) [PDF](#)

[Development and pharmacological evaluations of econazole nitrate microsperes enriched gel](#)

Author(s): Jaya Raja Kumar, Selvadurai Muralidharan and Vijayan V.

Page No: 257-265 [Abstract](#) [PDF](#)

[Simultaneous estimation of moxifloxacin hydrochloride and difluprednate in ophthalmic](#)

[formulation by three novel spectrophotometric methods](#)

Author(s): Patel Kalpana, Mangukiya Rakesh, Tandel Devang, Choksi Riddhi and Shah Purvi

Page No: 266-273 [Abstract](#) [PDF](#)

[A rapid extractive spectrophotometric determination of Cu \(II\) in biological, geological and pharmaceutical samples using o-hydroxyacetophenone isonicotinoylhydrazone](#)

Author(s): G. Trivikram Reddy, P. Nityananda Kumar Reddy, N. C. Gangi Reddy, Sangita D. Kumar and A. V. R. Reddy

Page No: 274-286 [Abstract](#) [PDF](#)

[Development and validation of RP-HPLC method for estimation of process related impurity in nimodipine bulk and formulation](#)

Author(s): Lubna B. Shaikh, Vishal V. Pande, Deepak S. Musmade and Poonam P. Patil

Page No: 287-290 [Abstract](#) [PDF](#)

[Effect of phytohormones on micropropagation and phytochemical studies of Aerva lanata \(Linn.\) Juss.ex Schult-A seasonal and vulnerable plant](#)

Author(s): S. Nandagopal, M. Lalitha, S. Abirami, D. Saikrishna and A. Priyan

Page No: 291-298 [Abstract](#) [PDF](#)

[Development of validated stability indicating assay method for tapentadol and paracetamol in bulk and combined dosage form](#)

Author(s): Kiran N. Kale and Krishna R. Gupta

Page No: 299-311 [Abstract](#) [PDF](#)

[Development and validation of analytical methods for estimation of rizatriptan benzoate in bulk and tablet dosage forms by UV spectroscopy](#)

Author(s): Ishan K. Chinnapurkar, Manjusha N. Dole and Sanjay D. Sawant

Page No: 312-319 [Abstract](#) [PDF](#)

[Stability indicating RP-HPLC method development and validation of foscarnet in bulk and pharmaceutical dosage form](#)

Author(s): V. Mohan Goud and A. Srinivasa Rao

Page No: 1-6 [Abstract](#) [PDF](#)

[Design and characterization of Moringa oleifera seed oil impregnated antiinflammatory topical micro-dispersion](#)

Author(s): Somnath Vibhute, Veena Kasture, Sanjay Kasture, Prakash Kendre, Shruti Rupnar and Vishal Pande

Page No: 7-16 [Abstract](#) [PDF](#)

[UV Spectrophotometric method for the estimation of candesartan cilexetil in bulk and pharmaceutical dosage form](#)

Author(s): G. Teja Lakshmi, Y. Srinivasa Rao, T. Hemant Kumar and K. Vara Prasada Rao

Page No: 17-22 [Abstract](#) [PDF](#)

[Hepatoprotective activity of Euphorbia neriifolia against paracetamol induced](#)

[hepatotoxicity in rats](#)

Author(s): Samaresh Datta, Biswakanth Kar, Gitanjali Mishra and Siva S Nayak

Page No: 23-28 [Abstract](#) [PDF](#)

[Effects of probiotic supplementation on glycemic and lipidemic status in trained body builders](#)

Author(s): Mehran Mesgari Abbasi, Nasrin Moradi, Mohammad Narimani-Rad and Alireza Lotfi

Page No: 29-32 [Abstract](#) [PDF](#)

[Method development and validation of RP-HPLC method for estimation of imatinib mesylate in pure and pharmaceutical dosage form](#)

Author(s): S. Naga Sindhu, Y Srinivasa Rao, T. Hemant Kumar and K. Vara Prasada Rao

Page No: 33-38 [Abstract](#) [PDF](#)

[Designing of forced degradation studies and development of validated stability indicating method for simultaneous estimation of desloratadine and montelukast odium in their formulation](#)

Author(s): Sk. Mastanamma, G. Rambabu, P. Saidulu and I. S. Tejaswini

Page No: 39-47 [Abstract](#) [PDF](#)

