Submission article: an anthraquinone derivative from Coptosapelta tomentosa (Blume) root (Merung)

Anton Rahmadi <arahmadi@unmul.ac.id>
9:51 AM (0 minutes ago)
to editor.ejobios, bo_bohari

Dear Editor,

We would like to submit an article entitled: Isolation and characterization of an anthraquinone derivative from Coptosapelta tomentosa (Blume) root (Merung).

Last year we reported toxicity test, antioxidant activity test and GC-MS profile of the active fraction of Coptosapelta tomentosa (Blume) root (Merung), resulting in several compound identified as Ethanone, 1- (1,3,4,4a, 5,6,7-hexahydro-2,5,5-trimethyl-2H- 2,4a-ethanonaphthalen-8-ol) - (32.08%), Squalene (26%), Lupeol (24.94%), 7-Hexadecyn-1-ol (2.88%), 2,6-Octadien-1-ol, 3,7-dimethyl-, (Z) - (1.24%), 9,10-Anthracenedione, 1-hydroxy-2- (hydroxymethyl) - (1.23%), and 4-isoquinoline, 3-ethoxy- (1.14%). 9,10-Anthracenedione, 1-hydroxy-2- (hydroxymethyl)- and 4-isoquinoline, 3-ethoxy-. The article was published in Eurasian Journal of Biosciences 13(2): 2403-2406, 2019.
As a continuation of the research, this article aimed to identify pure compound in the class of anthraquinone derivative from the ethyl acetate fraction of Coptosapelta tomentosa (Blume) root, namely 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol). The structure of the compound was established based on Ultraviolet Visible, Fourier Transformed Infra-Red (FTIR), Nuclear Magnetic Resonance (NMR), and Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF-MS) spectroscopic data. The compound has potent antitumor properties but with moderate antioxidant activity against murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. We hope that this article will add a significant contribution to the anti-tumor compound collections from the biodiversity of the plants.

Attached documents with the article: (1) cover letter, (2) Grammarly check report,(3) Plagiarism report (4) Plagiarism report vs the previous publication.

Best regards,

Anton Rahmadi

Isolation and characterization of an anthraquinone derivative from *Coptosapelta tomentosa* (Blume) root (*Merung*)

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ABSTRACT

Coptosapelta tomentosa (Blume) (*Merung*) is a type of tropical plants traditionally being used as a medicine by the Dayak tribes in Indonesia. This experiment aims to identify compound in the class of anthraquinone derivative from the ethyl acetate fraction of *Coptosapelta tomentosa* (Blume) root. In this study, an anthraquinone derivative was isolated from the ethyl acetate fraction of *Coptosapelta tomentosa* root using flash column chromatography. The compound was identified as 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (1). The structure of 1 was established based on Ultraviolet Visible, Fourier Transformed Infra-Red (FTIR), Nuclear Magnetic Resonance (NMR), and Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF-MS) spectroscopic data. The antitumor and antioxidant activities of this compound were investigated by MTT assay against murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. Antitumor and

antioxidant activity test results show that compound 1 may have potent antitumor property but with moderate antioxidant activity.

Keywords: antitumor, antioxidant, *Coptosapelta tomentosa,* DPPH, traditionally.

INTRODUCTION

Coptosapelta tomentosa (Blume), known locally as *Merung* or *Manuran*, is one of the tropical plants found in East Kalimantan, Indonesia. The local community of Dayak Kenyah uses the root of *Coptosapelta tomentosa* to treat malaria (Arnida et al. 2017). In addition, a decoction of the *Coptosapelta tomentosa* roots is also used to treat parasitic worm infections (Lin 2005). The previous studies indicate that the extract of *Coptosapelta tomentosa* has several biological activities, i.e., inhibits hem polymerization, shows antiplasmodial activity (Arnida et al. 2017); (Arnida et al. 2019), has toxicity to *Artemia salina* (Karolina et al. 2018; Supriningrum et al. 2016), and shows antioxidant activity against DPPH free radical scavenging (Bohari et al. 2019). This experiment aims to identify compounds in the class of anthraquinone derivative from the ethyl acetate fraction of the *Coptosapelta tomentosa* (Blume) root.

MATERIAL AND METHODS

Plant Material

Coptosapelta tomentosa (Blume) was collected from Tanjung Batu, Tenggarong Seberang District, Kutai Kartanegara, Kalimantan Timur. In the previous report, the plant species was verified by the Plant Anatomy and Systematics Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, UNMUL (Karolina et al. 2018).[4]

Isolation and Purification

The crude extract of *Merung* (164.67 g) obtained from the maceration of 6 kg dried powdered roots of *Coptosapelta tomentosa* (*Merung*), then partitioned with n-hexane and ethyl acetate to produce fractions of n-hexane (5.33 g), ethyl acetate (61.13 g) and methanol (71.13 g) (Bohari et al. 2019).

The ethyl acetate fraction (61.13 g) was subjected to a flash column chromatography using a silica gel 60 (70-230 mesh ASTM) eluted with *n*-hexane-EtOAc in a polarity gradient method to give six fractions (E_1 = 162.9 mg, E_2 = 227.4 mg, E_3 = 703.1, E_4 = 1,898.7 mg, E_5 = 2,476.3 mg end E_6 = 24,083.3 mg). E_4 fraction further fractionated by the same chromatographic method and eluent system, resulting in four derived fractions ($E_{4.1}$ = 45 mg, $E_{4.2}$ = 149.3 mg, $E_{4.3}$ = 200.8 mg, and $E_{4.4}$ = 695.3 mg). The $E_{4.2}$ fraction was purified by recystalization with *n*-hexane: ethyl acetate (3:7). About 33 grams of compound 1 were obtained.

FTIR, UV-Vis, NMR, and QTof MS Measurements

Infra-Red spectra measurements were carried out using Prestige-21 Fourier Transformed Infra-Red (FTIR) (Shimadzu, Japan). Ultraviolet (UV) spectra were recorded on a UV-Vis spectrophotometer (Variant Cary 100/300, USA). For Nuclear Magnetic Resonance (NMR), the sample was prepared in dimethylsulfoxide (DMSO). NMR spectra were recorded on NMR with a DD2 console system that operates at 500Hz (^{1}H) and 125 MHz (^{13}C) (Agilent, USA). Mass spectra were recorded on Ultra High-Pressure Chromatography coupled with Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF MS) (Xevo G2-XS, Waters Corporation, USA).

Antitumor assay

In vitro MTT (3- (4,5-dimethylthiazol-2-yl) -2,5-diphenyl) cytotoxic assay against murine P-388 leukemia cells measured the antitumor activity of the compound (1) (Alley et al. 1988; Sahidin et al. 2005; Hidayat et al. 2017).

Antioxidant assay with scavenging DPPH Radicals

Compound (1) was dissolved in methanol and made in several concentrations (20, 40, 80, 100 ppm), each solution was put 4 ml into a cuvette, and then added 1 mL of 0.024 µg/mL DPPH solution, homogenized and incubated in a dark room for 30 minutes. Then absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength (508-520 nm). The blanks were made without adding samples. All treatment was performed three times. IC_{50} determination was conducted using linear regression of %-inhibition versus concentrations (Erwin et al. 2019; Supomo et al. 2019).

RESULT AND DISCUSSION

Compound (1) was obtained as an orange powder with a melting point of 205-208 ^{o}C. UPLC/QToF MS spectrum data shows $[M\text{-}OH]^{+}$ = 237.0547, according to the molecular formula $C_{15}H_{10}O_4$. The UV-Vis spectrum of compound 1 shows characteristic absorption at λ 253, 279, and 325 nm for the anthraquinone skeleton. UV spectrum data obtained absorption peaks at λ_{max} at 402, 325, 279, and 253 nm. IR absorption peaks were 3263.56, 3076.46, 2927.94, 2854.65, 1635.64 and 1670.35 cm^{-1}. These peaks identified as OH, –**C**=**C**–H, aliphatic CH, chelated C=O, and unchelated C=O, respectively. The presence of an OH group in position 1 was shown by absorption at λ_{max} of 402 nm. The peak supported the evidence at 3263.56 cm^{-1} in the FT-IR spectrum and 12.74 ppm (s, 1H) in ^{1}H-NMR. The absorption of 1635.64 and 1670.35 cm^{-1} in the FTIR spectrum shows the presence of chelated and unchelated quinone carbonyls (Ee et al. 2009). The absorption bands indicated the presence of

aromatic and aliphatic CH group in the FTIR spectrum at 3076.46 (aromatic CH), 2927.94, and 2854 cm^{-1} (aliphatic CH), respectively.

The presence of the $–CH_2$-OH group indicated when the proton signaled at 4.64 ppm (d, *J* = 12 Hz, 2H) (H-11) coupled with a signal at 5.44 ppm (t, *J* = 11.0 Hz, OH), and attached to C-11 (57.39 ppm). HMBC spectrum data shows that H-11 has a long-distance correlation with carbon at C-1, C-2, C-3, and C-4, so that the -CH_2-OH group attached to C-2. The doublet signaled at 7.89 ppm (d, *J* = 15.6 Hz) (H-3) was coupled to 7.74 ppm (d, *J* = 17.9 Hz) (4). The H-NMR spectrum of compound 1 also showed peaks at 8.17 ppm (d, *J* = 7.0 Hz, 1H) (5), 7.93 ppm (t, *J* = 6.2; 7.4 Hz, 2H) (5 and 6) and 8.22 ppm (d, *J* = 6.8 Hz, 1H) (Table 1). These peaks implied the existence of unsubstituted C rings. The absorption pattern in the H and C-NMR spectrum of the ring C of compound 1 is similar to the ring C of 2-ethoxy-1-hydroxyanthraquinone (Ee et al. 2009). Based on UV, IR, 1D-2D-NMR, QToF MS data, and compared with the NMR literature data (Kuo et al. 1995), it was concluded that compound 1 was 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (Figure 1).

The 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione has an IC_{50} value of 6.87 μg/mL in the MTT assay against murine leukemia P-388 cells and IC_{50} value of the antioxidant activity of 26.30 μg/mL against DPPH free radical.

CONCLUSION

The 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) has been isolated from the ethyl acetate fraction of the *Coptosapelta tomentosa* root. Antitumor and antioxidant activity test results showed that 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dion (1) has significant antitumor activity potential, but its antioxidant activity was moderate with IC_{50} values of 6.87 and 26.30 μg / mL, respectively.

ACKNOWLEDGMENT

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REFERENCE

Alley MC, Scudiero DA, Monks A, Hursey ML, Czerwinski MJ, Fine DL, Abbot BJ, Mayo JG, Shoemaker RH, Boyd MR (1988) Feasibility of Drug Screening with Panels of Human Tumor Cell Lines Using a Microculture Tetrazolium Assay. Cancer Research 48: 589-601.

Arnida, Sahi EK, Sutomo (2017) Aktivitas Antiplasmodium *In vitro* Dan Identifikasi Golongan Senyawa Dari Ekstrak Etanol Batang Manuran (*Coptosapelta tomentosa* Valeton ex K.Heyne) Asal Kalimantan Selatan. Jurnal Ilmiah Ibnu Sina 2(2): 270 – 278. https://doi.org/10.36387/jiis.v2i2.119

Arnida, Sutomo, Rusyida L (2019) Aktivitas Penghambatan Polimerasi Hem Dari Fraksi Etil Asetat Daun Manuran, *Coptosapelta tomentosa* Valeton ex K.Heyne (Rubiaceae). Jurnal Fitofarmaka Indonesia 6(1): 309-314. http://10.33096/jffi1.459

Bohari, Karolina A, Pratiwi DR, Erwin, Rahmadi A (2019) Toxicity test, antioxidant activity test, and GC-MS profile of the active fraction of *Coptosapelta tomentosa* (Blume) root (*Merung*). Eurasian Journal of Biosciences 13(2): 2403-2406.

Ee GCL, Wen YP, Sukari MA, Go R, Lee HL (2009) A new anthraquinone from *Morinda citrifolia* roots. Natural Product Research 23(14): 1322–1329.

Erwin, Pusparohmana WR, Sari IP, Hairani R, Usman (2019) GC-MS profiling and DPPH radical scavenging activity of the bark of Tampoi (*Baccaurea macrocarpa*). F1000Research *7*(1977): 1-8. https://doi.org/10.12688/f1000research.16643.2

Hidayat AC, Farabi K, Harneti D, Nurlelasari, Maharani R, Mayanti T, Supratman U, Shiono Y (2017) A Cytotoxic Rocaglate Compound from The Stem bark of *Aglaia argentea* (Meliaceae). *Molekul* 2(2): 146 – 152. http://10.20884/1.jm.2017.12.2.361

Karolina A, Pratiwi DR, Erwin (2018) Phytochemical and Toxicity Test of *Merung* Extracts. Jurnal Atomik 03(2): 79-82

Kuo SC, Chen PR, Lee SW, Chen ZT (1995) Constituents of Roots of Rubia lanceolata Hayata. Journal of the Chinese Chemical Society 42: 869-871. https://doi.org/10.1002/jccs.1995 00117

Lin KW (2005) Ethnobotanical Study Of Medical Plants Used By The Jah Hut Peoples In Malaysia. Indian Journal of Medical Sciences 59(4): 156-161.

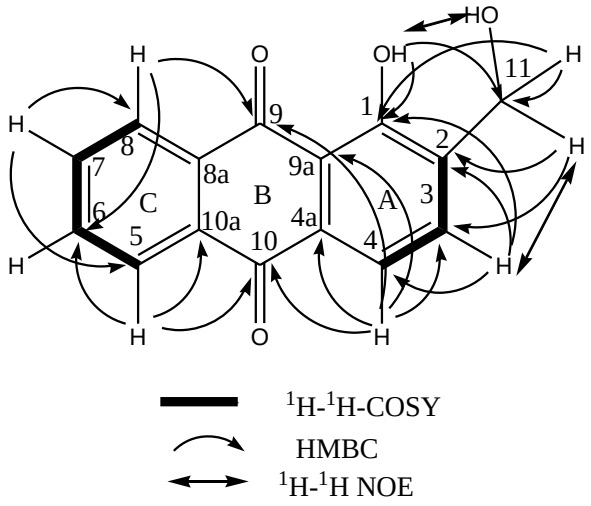
Sahidin, Hakim EH, Juliawaty LD, Syah YM, Din L, Ghisalberti EL, Latip J, Said IM, Achmad SA (2005) Cytotoxic Properties of Oligostilbenoids from the Tree Barks of Hopea dryobalanoides. Z. Naturforsch 60(c): 723-727. https://doi.org/10.1515/znc-2005-9-1011

Supomo, Syamsul ES, Apriliana A, Saleh C, Erwin, Lestari D (2019) Antioxidant Assay of Dayak Onion *(Eleutherine palmifolia)* via DPPH (1,1-Difenil-2-Pikrilhidrazil) and BSLT Test for its Active Fraction. Rasayan Journal of Chemistry 12(3): 1340-1346. http://dx.doi.org/10.31788/RJC.2019.1235264

Supriningrum R, Sapri, Pranamala VA (2016) Uji Toksisitas Akut Ekstrak Etanol Akar KB (*Coptosapelta tomentosa* Valeton ex K.Heyne) dengan Metode Brine Shrimp Lethality Test (BSLT). Jurnal Ilmiah Manuntung 2(2): 161-165.

Table 1. ^{1}H- and ^{13}C-NMR Spectroscopic data of compound 1

No	Chemical Shift (ppm)				HMBC (^{1}H →^{13}C)
	^{13}C-NMR	^{13}C-NMR (Kuo et al. 1995)	^{1}H-NMR	^{1}H-NMR (Kuo et al. 1995)	
1-OH	158.35	158.64	12.74 (s; 1H)	12.55 (s; 1H)	C-1, C-11
2	131.24	137.58	-		-
3	133.53	133.07	7.89 (d, *J* = 7.8 Hz; 1H)	7.50 (m; 1H)	C-1, C-2, C-4, C-11
4	118.81	118.36	7.74 (d, *J* = 8.9 Hz; 1H)	7.58 (l H, d, *J*= 8.0 Hz)	C-3,C-4a, C-9,C-9a ,C-10
4a	138.25	130.79	-		-
5	126.82	126.37	8.17 (d, *J* = 7.0Hz;1H)	7.94 (m; 1H)	C-6, C-8a, C-10, C-10a
6	134.53	133.92	7.93 (t, *J* = 6.2, 7.4 Hz; 1H)	7.50 (m; 1H)	C-5, C-8,C-10a
7	135.12	133.33	7.93 (t, *J* = 6.2, 7.4 Hz; 1H)	7.50 (m; 1H)	C-5, C-8,C-10a
8	126.53	125.98	8.22 (d, *J* = 6.8 Hz; 1H)	7.94 (m; 1H)	C-6, C-9
8a	133.18	132.30	-		-
9	188.62	188.08	-		-
9a	114.83	114.20	-		-
10	181.71	181.35	-		-
10a	132.75	132.80	-		-
11	57.39	57.69	4.64 (d, *J* = 6.0 Hz; 2H)	4.46 (d, *J* = 5.6 Hz; 2H)	C-1, C-2, C-3, C-4,
11-OH	-		5.44 (t, *J* = 5.5 Hz; 1H)	4.62 (t, *J* = 5.6 Hz, 1H)	C-11



1-hydroxy-2-(hydroxymethyl)anthracene-9,10-dione

Figure 1. The structural compound of Digiferruginol from *Coptosapelta tomentosa*

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ABSTRACT Coptosapelta tomentosa (Blume) (Merung) is a type of tropical plant that has traditionally been used as medicine by the Dayaks in Indonesia. In this study, 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (1), an anthraquinone derivative was isolated from the ethyl acetate fraction of Coptosapelta tomentosa root using flash column chromatography.

The structure of 1 was established on the basis of UV Vis, FT-IR, NMR, and LCMSMS spectroscopic data. The antitumor and antioxidant activity of this compound was investigated using murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. Antitumor and antioxidant activity test results show that compound 1 has potentially as a significant antitumor activity but its antioxidant activity was only moderate.

Keyword: Coptosapelta tomentosa, traditionally, antitumor, antioxidant, and DPPH INTRODUCTION Coptosapelta tomentosa (Blume) (known locally as merung or manuran) is one of the tropical plants found in East Kalimantan. In Indonesia, the Dayak Kenyah community uses the root of Coptosapelta tomentosa to treat malaria (Arnida et al. 2017).

In addition decoction of the Coptosapelta tomentosa roots is also used to treat worm infection paracitic (Lin. 2005). The previous studies indicate that the extract of Coptosapelta tomentosa has several biological activities such as can inhibit hem polymerization, antiplasmodium activity (Arnida et al. 2017); (Arnida et al. 2019), toxic against Artemia salina (Karolina et al, 2018); (Supriningrum et al.

2016), and active as an antioxidant against DPPH free radical scavenging (Bohari et al.

2019). As a continuation of research on Coptosapelta tomentosa, an anthraquinone derivative will be reported that has been isolated from the ethyl acetate fraction of Coptosapelta tomentosa (Blume) root. EXPERIMENTAL General IR spectra measurements were carried out using Shimadzu IR Prestige-21 FTIR.

Ultraviolet (UV) spectra were recorded on a Variant Cary 100/300 UV-Vis Spectrophotometer. NMR spectra were recorded in the DMSO on a NMR angilent 500 MHz with a DD2 console system that operates at 500Hz (1H) and 125 MHz (13C). Mass spectra were recorded on Xevo G2-XS QTof Mass Spectrometer (Waters Corporation).

Plant Material Coptosapelta tomentosa (Blume) was collected from Tanjung Batu, Tenggarong Seberang District, Kutai Kartanegara, Kalimantan Timur. In a previous report, this plant had previously been identified in the Plant Anatomy and Systematics Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, UNMUL (Karolina et al. 2018).4 Isolation and Purification The crude extract (164.67 g) obtained from maceration of 6 kg dried powdered roots of Coptosapelta tomentosa (Merung), then partitioned with n-hexane and ethyl acetate to give fractions of n-hexane (5.33 g), ethyl acetate (61.13 g) and methanol (71.13 g) (Bohari et al. 2019). The ethyl acetate fraction (61.13 g) was subjected to a flash column chromatography using silica gel 60 (70-230 mesh ASTM) eluted with n-hexane-EtOAc in a polarity gradient method to give six fractions (E1 = 162.9 mg, E2 = 227.4 mg, E3 = 703.1, E4 = 1,898.7 mg, E5 = 2,476.3 mg end E6 = 24,083.3 mg).

E4 further fractionation using the same chromatography and eluent system to give 4 fractions (E4.1 = 45 mg, E4.2 = 149.3 mg, E4.3 = 200.8 mg, and E4.4 = 695.3 mg). E4.2 was purified by recystalization with n-hexane: ethyl acetate and 33 grams of compound 1 were obtained. Compound (1) Compound 1 was obtained as an orange powder with melting point 202-205 oC.

UV spectrum data obtained absorption peaks at ?max: 402, 325, 279, and 253 nm. IR absorption peaks are 3263.56 cm-1 (OH), 3076.46 (-C=C-H), 2927.94 and 2854.65 (aliphatic CH), 1635.64 (chelated C=O) and 1670.35 cm-1 (unchelated C=O). 1H-NMR absorption: [500 MHz, DMSO] ? (ppm), 7.74 (d, J = 8.9 Hz, 1H), 7.89 (d, J = 7.8 Hz, 1H), 7.93 (t, J = 6.2 Hz, and 7.4 Hz, 2H), 8.17 (d, J = 7.0 Hz, 1H), 8.22 (d, J = 6.8 Hz, 1H), 4.64 (d, J = 6.0 Hz; 2H) 12.74 (s, OH), and 5.44 (t, J = 5.5

Hz, 1H).13C-NMR absorption [125 MHz, DMSO] (? ppm): 57.39 (methylene carbon), 118.81, 126.53, 126.82, 133.53, 134.53, and 135.12 (aromatic carbon methyne), 114.83, 131.24, 132.75, 133.18, 138.25, 158.35, 181.71 and 188.62 (aromatic carbon quartener). Antitumor assay Compound (1) was measured its antitumor activity was carried out

using a cytotoxic test against murine P-388 leukemia cells in vitro by the MTT method (3- (4,5-dimethylthiazol-2-yl) -2,5-diphenyl) assay (Alley et al. 1988); (Sahidin et al, 2005); (Hidayat et al. 2017).

Antioxidant assay with scavenging DPPH Radicals Compound (1) was dissolved in methanol and made in several concentrations (20, 40, 80, 100 ppm), each solution was put 4 ml into a cuvette, and then added 1 mL of 0.024 µg / mL DPPH solution, homogenized and incubated in a dark room for 30 minutes. Then absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength (508-520 nm). The blanks are made without adding samples.

All treatment was performed three times. IC50 determination was conducted using linear regression of % inhibition versus concentrations (Erwin et al. 2019); (Supomo et al. 2019). RESULT AND DISCUSSION Compound (1) was obtained as an orange powder with a melting point of 205-208 oC. LCMSMS spectrum data shows [M-OH] + = 237.0547 according to the molecular formula C15H10O4.

The UV-Vis spectrum of compound 1 shows characteristic absorption at ? 253, 279, and 325 nm for the anthraquinone skeleton. The presence of an OH group in position 1 was shown by absorption at ?max 402 nm and it was supported by peaks at 3263.56 cm-1 in the FT-IR spectrum and 12.74 ppm (s, 1H) in 1H-NMR. The absorption of 1635.64 and 1670.35 cm-1 in the FTIR spectrum shows the presence of chelated and unchelated quinone carbonyls (Ee et al.

2009). The presences of aromatic CH groups and an aliphatic CH group in the FTIR spectrum were indicated by the absorption bands at 3076.46 (aromatic CH), and 2927.94, 2854 cm1 (aliphatic CH), respectively. The 1H-NMR spectra of compound 1 showed a methylene proton signal at d 4.64 ppm (d, J = 6.0 Hz, 2H), five aromatic signal protons 7.74 ppm (d, J = 8.9 Hz, 1H), 7.89 ppm (d, J = 7.8 Hz, 1H), 7.93 ppm (t, J = 6.2 Hz and 7.4 Hz, 2H), 8.17 ppm (d, J = 7.0

Hz, 1H), 8.22 ppm (d, J = 6.8 Hz, 1H) and two hydroxyl-group signals at 12.74 ppm (s, 1H) and 5.44 ppm (t, J = 6.6 Hz, 1H). The 13C-NMR spectrum supported by DEPT 135 spectrum showed compound 1 consisting of 15 signals, one carbon methylene sp3 at 57.39 ppm, six carbon methyne aromatics at 118.81, 126.53, 126.82, 133.53, 134.53 and 135.12 ppm, and eight quaternary carbons at 114.83, 131.24, 132.75, 133.18, 138.25, 158.35, 181.71 (carbonyl groups) and 188.62 ppm (carbonyl groups). All-carbon quaternary location determined based on data from HMBC spectra. Proton signals at 4.64 ppm (d, J = 12 Hz, 2H) (H-11) attached to C-11 (57.39 ppm) and due to coupling with signal at 5.44 ppm (t, J = 11.0 Hz, OH) indicates the presence of -CH2-OH group.

HMBC spectrum data shows that H-11 has a long distance correlation with carbon at C-1, C-2, C-3, and C-4, so that the -CH2-OH group attached to C-2. The doublet signal at 7.89 ppm (d, J = 15.6 Hz) (H-3) was coupled to 7.74 ppm (d, J = 17.9 Hz) (4). The H-NMR spectrum of compound 1 also showed peaks at 8.17 ppm (d, J = 7.0 Hz, 1H) (5), 7.93 ppm (t, J = 6.2; 7.4 Hz, 2H) (5 and 6) and 8.22 ppm (d, J = 6.8 Hz, 1H), implies the existence of unsubstituted C rings.

The absorption pattern in the H and C-NMR spectrum of the ring C of compound 1 is similar to the absorption pattern of the ring C of 2-ethoxy-1-hydroxyanthraquinone (Ee et al. 2009). Based on UV, IR, 1D-2D-NMR, LCMSMS data and compared with the NMR literature data (Kuo et al. 1995), it was concluded that compound 1 was 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol). Table 1.

1H- and 13C-NMR Spectroscopic data of compound 1 No Chemical Shift (ppm) HMBC (1H ®13C) 13C-NMR 13C-NMR (Kuo et al. 1995) 1H-NMR 1H-NMR (Kuo et al. 1995) 1-OH 158.35 158.64 12.74 (s; 1H) 12.55 (s; 1H) C-1, C-11 2 131.24 137.58 - - 3 133.53 133.07 7.89 (d, J = 7.8 Hz; 1H) 7.50 (m; 1H) C-1, C-2, C-4, C-11 4 118.81 118.36 7.74 (d, J = 8.9 Hz; 1H) 7.58 (l H, d, J= 8.0 Hz) C-3,C-4a, C-9,C-9a ,C-10 4a 138.25 130.79 - - 5 126.82 126.37 8.17 (d, J = 7.0Hz;1H) 7.94 (m; 1H) C-6, C-8a, C-10, C-10a 6 134.53 133.92 7.93 (t, J = 6.2, 7.4 Hz; 1H) 7.50 (m; 1H) C-5, C-8,C-10a 7 135.12 133.33 7.93 (t, J = 6.2, 7.4 Hz; 1H) 7.50 (m; 1H) C-5, C-8,C-10a 8 126.53 125.98 8.22 (d, J = 6.8 Hz; 1H) 7.94 (m; 1H) C-6, C-9 8a 133.18 132.30 - - 9 188.62 188.08 - - 9a 114.83 114.20 - - 10 181.71 181.35 - - 10a 132.75 132.80 - - 11 57.39 57.69 4.64 (d, J = 6.0 Hz; 2H) 4.46 (d, J = 5.6 Hz; 2H) C-1, C-2, C-3, C-4, 11-OH - 5.44 (t, J = 5.5 Hz; 1H) 4.62 (t, J = 5.6

Hz, 1H) C-11 The results of the 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione cytotoxic test against P-388 murine leukemia cells and antioxidants using the DPPH free radical scavenging method were obtained IC50 values of 6.87 and 26.30 ?g / mL, respectively. CONCLUSION The 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) has been isolated from the ethyl acetate fraction of the Coptosapelta tomentosa root.

Antitumor and antioxidant activity test results showed that 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dion (1) has significant antitumor activity potential but its antioxidant activity was moderate with IC50 values of 6.87 and 26.30 ?g / mL, respectively. ACKNOWLEDGMENT The author gratefully acknowledges the assistance of research funding by ISDB with the contract number: 137/UN.17.11/PL/2019.

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Isolation and Characterization of an Anthraquinone derivative from Coptosapelta tomentosa Blume root Merung Erwin1 Anita Karolina Dari 1 Djihan Ryn Pratiwi 1 Bohari 1 Anton Rahmadi 2 3* 1 Department of Chemistry Faculty of Mathematics and Natural Sciences University of Mulawarman INDONESIA 2 Research Centre for Medicine and Cosmetics from Tropical Rainforest Resources University of Mulawarman INDONESIA
3 Dept of Agricultural Products Technology Faculty of Agriculture University of Mulawarman INDONESIA
*Corresponding author arahmadi@unmul ac id ABSTRACT Coptosapelta tomentosa Blume Merung is a type of tropical plant that has traditionally been used as medicine by the Dayaks in Indonesia In this study an anthraquinone derivative was isolated from the ethyl acetate fraction of Coptosapelta tomentosa root using flash column chromatography The compound was identified as 1 hydroxy 2 hydroxymethyl anthracene 9 10 dione Digiferruginol 1 The structure of 1 was established based on UV Vis FT IR NMR and LCMSMS spectroscopic data The antitumor and antioxidant activity of this compound was investigated using murine leukemia P 388 cells and DPPH free radical scavenging method respectively Antitumor and antioxidant activity test results show that compound 1 has potential as a significant antitumor activity but its antioxidant activity was only moderate Keyword Coptosapelta tomentosa traditionally antitumor antioxidant and DPPH INTRODUCTION Coptosapelta tomentosa Blume known locally as merung or manuran is one of the tropical plants found in East Kalimantan In Indonesia the Dayak Kenyah community uses the root of Coptosapelta tomentosa to treat malaria Arnida et al 2017 In addition a decoction of the Coptosapelta tomentosa roots is also used to treat worm infection parasitic Lin 2005 The previous studies indicate that the extract of Coptosapelta tomentosa has several biological activities such as can inhibit hem polymerization antiplasmodial activity Arnida et al 2017 Arnida et al 2019 toxic against Artemia salina Karolina et al 2018 Supriningrum et al 2016 and active as an antioxidant against DPPH free radical scavenging Bohari et al 2019 As a continuation of research on Coptosapelta tomentosa an anthraquinone derivative will be reported that has been isolated from the ethyl acetate fraction of Coptosapelta tomentosa Blume root EXPERIMENTAL General IR spectra measurements were carried out using Shimadzu IR Prestige 21 FTIR Ultraviolet UV spectra were recorded on a Variant Cary 100/300 UV Vis Spectrophotometer NMR spectra were recorded in the DMSO on NMR Agilent 500 MHz with a DD2 console system that operates at 500Hz 1H and 125 MHz 13C Mass spectra were recorded on Xevo G2 XS QTof Mass Spectrometer Waters Corporation Plant Material Coptosapelta tomentosa Blume was collected from Tanjung Batu Tenggarong Seberang District Kutai Kartanegara Kalimantan Timur In the previous report this plant was previously identified in the Plant Anatomy and Systematics Laboratory Department of Biology Faculty of Mathematics and Natural Sciences UNMUL Karolina et al 2018 4 Isolation and Purification The crude extract 164 67 g obtained from the maceration of 6 kg dried powdered roots of Coptosapelta tomentosa Merung then partitioned with n hexane and ethyl acetate to give fractions of n hexane 5 33 g ethyl acetate 61 13 g and methanol 71 13 g Bohari et al 2019 The ethyl acetate fraction 61 13 g was subjected to a flash column chromatography using silica gel 60 70 230 mesh ASTM eluted with n hexane EtOAc in a polarity gradient method to give six fractions E1 = 162 9 mg E2 = 227 4 mg E3 = 703 1 E4 = 1 898 7 mg E5 = 2 476 3 mg end E6 = 24 083 3 mg E4 further fractionation using the same chromatography and eluent system to give 4 fractions E4 1 = 45 mg E4 2 = 149 3 mg E4 3 = 200 8 mg and E4 4 = 695 3 mg E4 2 was purified by recystalization with n hexane ethyl acetate and 33 grams of compound 1 were obtained Compound 1 Compound 1 was obtained as an orange powder with melting point 202 205 oC UV spectrum data obtained absorption peaks at max 402 325 279 and 253 nm IR absorption peaks are 3263 56 cm 1 OH 3076 46 -C=C-H 2927 94 and 2854 65 aliphatic CH 1635 64 chelated C=O and 1670 35 cm 1 unchelated C=O 1H NMR absorption [500 MHz DMSO] d ppm 7 74 d J = 8 9 Hz 1H 7 89 d J = 7 8 Hz 1H 7 93 t J = 6 2 Hz and 7 4 Hz 2H 8 17 d J = 7 0 Hz 1H 8 22 d J = 6 8 Hz 1H 4 64 d J = 6 0 Hz 2H 12 74 s OH and 5 44 t J = 5 5 Hz 1H 13C NMR absorption [125 MHz DMSO] d ppm 57 39 methylene carbon 118 81 126 53 126 82 133 53 134 53 and 135 12 aromatic carbon methyne 114 83 131 24 132 75 133 18 138 25 158 35 181 71 and 188 62 aromatic carbon quartener Antitumor assay In vitro MTT 3 4 5 dimethylthiazol 2 yl 2 5 diphenyl cytotoxic assay against murine P 388 leukemia cells measured the antitumor activity of compound 1 Alley et

al 1988 Sahidin et al 2005 Hidayat et al 2017 Antioxidant assay with scavenging DPPH Radicals Compound 1 was dissolved in methanol and made in several concentrations 20 40 80 100 ppm each solution was put 4 ml into a cuvette and then added 1 mL of 0 024 µg / mL DPPH solution homogenized and incubated in a dark room for 30 minutes Then absorbance was measured using a UV Vis spectrophotometer at the maximum wavelength 508 520 nm The blanks were made without adding samples All treatment was performed three times IC50 determination was conducted using linear regression of % inhibition versus concentrations Erwin et al 2019 Supomo et al 2019 RESULT AND DISCUSSION Compound 1 was obtained as an orange powder with a melting point of 205 208 oC LCMSMS spectrum data shows [M OH] + = 237 0547 according to the molecular formula C15H10O4 The UV Vis spectrum of compound 1 shows characteristic absorption at 253 279 and 325 nm for the anthraquinone skeleton The presence of an OH group in position 1 was shown by absorption at max of 402 nm The peak supported the evidence at 3263 56 cm 1 in the FT IR spectrum and 12 74 ppm s 1H in 1H NMR The absorption of 1635 64 and 1670 35 cm 1 in the FTIR spectrum shows the presence of chelated and unchelated quinone carbonyls Ee et al 2009 The absorption bands indicated the presence of aromatic CH groups and an aliphatic CH group in the FTIR spectrum at 3076 46 aromatic CH and 2927 94 2854 cm1 aliphatic CH respectively The 1H NMR spectra of compound 1 showed a methylene proton signal at 4 64 ppm d J = 6 0 Hz 2H five aromatic signal protons at 7 74 ppm d J = 8 9 Hz 1H 7 89 ppm d J = 7 8 Hz 1H 7 93 ppm t J = 6 2 Hz and 7 4 Hz 2H 8 17 ppm d J = 7 0 Hz 1H and 8 22 ppm d J = 6 8 Hz 1H Two hydroxyl group signaled at 12 74 ppm s 1H and 5 44 ppm t J = 6 6 Hz 1H The 13C NMR spectrum supported by DEPT 135 spectrum showed 15 signals from compound 1 including one carbon methylene sp3 at 57 39 ppm six carbon methyne aromatics at 118 81 126 53 126 82 133 53 134 53 and 135 12 ppm and eight quaternary carbons at 114 83 131 24 132 75 133 18 138 25 158 35 181 71 carbonyl groups and 188 62 ppm carbonyl groups All carbon quaternary location determined based on data from HMBC spectra The presence of the -CH2 OH group indicated when the proton signaled at 4 64 ppm d J = 12 Hz 2H H 11 coupled with a signal at 5 44 ppm t J = 11 0 Hz OH and attached to C 11 57 39 ppm HMBC spectrum data shows that H 11 has a long distance correlation with carbon at C 1 C 2 C 3 and C 4 so that the CH2 OH group attached to C 2 The doublet signaled at 7 89 ppm d J = 15 6 Hz H 3 was coupled to 7 74 ppm d J = 17 9 Hz 4 The H NMR spectrum of compound 1 also showed peaks at 8 17 ppm d J = 7 0 Hz 1H 5 7 93 ppm t J = 6 2 7 4 Hz 2H 5 and 6 and 8 22 ppm d J = 6 8 Hz 1H These peaks implied the existence of unsubstituted C rings The absorption pattern in the H and C NMR spectrum of the ring C of compound 1 is similar to the ring C of 2 ethoxy 1 hydroxyanthraquinone Ee et al 2009 Based on UV IR 1D 2D NMR LCMSMS data and compared with the NMR literature data Kuo et al 1995 it was concluded that compound 1 was 1 hydroxy 2 hydroxymethyl anthracene 9 10 dione Digiferruginol _ Table 1 1H and 13C NMR Spectroscopic data of compound 1 No _Chemical Shift ppm _HMBC 1H 13C _ _ _ 13C NMR _13C NMR Kuo et al 1995 _1H NMR _1H NMR Kuo et al 1995 _ _ _1 OH _158 35 _158 64 _12 74 s 1H _12 55 s 1H _C 1 C 11 _ _2 _131 24 _137 58 _ _ _ _ _3 _133 53 _133 07 _7 89 d J = 7 8 Hz 1H _7 50 m 1H _C 1 C 2 C 4 C 11 _ _4 _118 81 _118 36 _7 74 d J = 8 9 Hz 1H _7 58 l H d J= 8 0 Hz _C 3 C 4a C 9 C 9a C 10 _ _4a _138 25 _130 79 _ _ _ _ _5 _126 82 _126 37 _8 17 d J = 7 0Hz 1H _7 94 m 1H _C 6 C 8a C 10 C 10a _ _6 _134 53 _133 92 _7 93 t J = 6 2 7 4 Hz 1H _7 50 m 1H _C 5 C 8 C 10a _ _7 _135 12 _133 33 _7 93 t J = 6 2 7 4 Hz 1H _7 50 m 1H _C 5 C 8 C 10a _ _8 _126 53 _125 98 _8 22 d J = 6 8 Hz 1H _7 94 m 1H _C 6 C 9 _ _8a _133 18 _132 30 _ _ _ _ _9 _188 62 _188 08 _ _ _ _ _9a _114 83 _114 20 _ _ _ _ _10 _181 71 _181 35 _ _ _ _ _10a _132 75 _132 80 _ _ _ _ _11 _57 39 _57 69 _4 64 d J = 6 0 Hz 2H _4 46 d J = 5 6 Hz 2H _C 1 C 2 C 3 C 4 _ _11 OH _ _ _5 44 t J = 5 5 Hz 1H _4 62 t J = 5 6 Hz 1H _C 11 _ _ The results of the 1 hydroxy 2 hydroxymethyl anthracene 9 10 dione cytotoxic test against P 388 murine leukemia cells and antioxidants using the DPPH free radical scavenging method were obtained IC50 values of 6 87 and 26 30 µg / mL respectively CONCLUSION The 1 hydroxy 2 hydroxymethyl anthracene 9 10 dione Digiferruginol has been isolated from the ethyl acetate fraction of the Coptosapelta tomentosa root Antitumor and antioxidant activity test results showed that 1 hydroxy 2 hydroxymethyl anthracene 9 10 dion 1 has significant antitumor activity potential but its antioxidant activity was moderate with IC50 values of 6 87 and 26 30 µg / mL respectively ACKNOWLEDGMENT The author gratefully acknowledges the assistance of research funding by ISDB with the contract number 137/UN 17 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Morinda citrifolia roots Natural Product Research 23 14 1322-1329 Erwin Pusparohmana WR Sari IP Hairani R Usman 2019 GC MS profiling and DPPH radical scavenging activity of the bark of Tampoi Baccaurea macrocarpa F1000Research 7 1977 1 8 https //doi org/10 12688/f1000research 16643 2 Hidayat AC Farabi K Harneti D Nurlelasari Maharani R Mayanti T Supratman U Shiono Y 2017 A Cytotoxic Rocaglate Compound from The Stem bark of Aglaia argentea Meliaceae Molekul 2 2 146 - 152 http //10 20884/1 jm 2017 12 2 361 Karolina A Pratiwi DR Erwin 2018 Phytochemical and Toxicity Test of Merung Extracts Jurnal Atomik 03 2 79 82 Kuo SC Chen PR Lee SW Chen ZT 1995 Constituents of Roots of Rubia lanceolata Hayata Journal of the Chinese Chemical Society 42 869 871 https //doi org/10 1002/jccs 199500117 Lin KW 2005 Ethnobotanical Study Of Medical Plants Used By The Jah Hut Peoples In Malaysia Indian J Medical Sci 59 4 156 161 Sahidin Hakim EH Juliawaty LD Syah YM Din L Ghisalberti EL Latip J Said IM Achmad 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12 3 1340 1346 http //dx doi org/10 31788/RJC 2019 1235264 Supriningrum R Sapri Pranamala VA 2016 Uji Toksisitas Akut Ekstrak Etanol Akar KB Coptosapelta tomentosaValeton ex K Heyne dengan Metode Brine Shrimp Lethality Test BSLT Jurnal Ilmiah Manuntung 2 2 161 165

Toxicity test antioxidant activity test and GC MS profile of the active fraction of Coptosapelta tomentosa Blume root Merung

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Abstracts Merung Coptosapelta tomentosa Blume is one of the plants of the genus Coptosapelta commonly found in the forests of Borneo People in Kalimantan especially in East Kalimantan and South Kalimantan use the extract of merung root as traditional medicine for aphrodisiacs blood clots menstruation inflammatory or swollen pain rheumatism and diarrhea This study aims to determine the toxicity with the brine shrimp lethality test BSLT method and antioxidant activity with the DPPH radical scavenging method of crude extracts and their fractions from merung roots and to determine the chemical content of the most active fractions using GC MS Based on the results of the toxicity test and antioxidant activity test showed that the ethyl acetate fraction was the most active extract compared to the others with LC50 and IC50 values of 123 83 µg/mL and 31 160 µg/mL respectively GC MS spectrum analysis results of ethyl acetate fraction compared with the database obtained major compounds namely Ethanone 1 1 3 4 4a 5 6 7 hexahydro 2 5 5 trimethyl 2H 2 4a ethanonaphthalen 8 ol 32 08% Squalene 26% Lupeol 24 94% 7 Hexadecyn 1 ol 2 88% 2 6 Octadien 1 ol 3 7 dimethyl Z 1 24% 9 10 Anthracenedione 1 hydroxy 2 hydroxymethyl 1 23% and 4 isoquinoline 3 ethoxy 1 14% 9 10 Anthracenedione 1 hydroxy 2 hydroxymethyl and 4 isoquinoline 3 ethoxy potentially as antioxidants There are also several other minor aromatic phenolic compounds which can have antioxidant potential Keywords Merung Coptosapelta tomentosa Blume antioxidants activity DPPH radical toxicity chemical composition

INTRODUCTION Indonesia is one of the countries rich in biodiversity The people of Indonesia have long recognized the use of plants in traditional medicine Jamu herbal medicine is one example of the heritage of traditional medicine consumed and it is believed to cure certain diseases Merung plant Coptosapelta tomentosa Valeton K Heyne 1 is one of the plants used in traditional medicine especially in Kalimantan Merung another local name is Manuran/Maniren by the people of South Kalimantan has long been used in traditional medicine as an aphrodisiac drug and to reduce blood menstruation Merung root is used to treat inflammation or swelling rheumatism and diarrhea by the people of East Kalimantan2 The plant may contain substances beneficially to ameliorate symptoms caused by bacteria hepatotoxin inflammation virus diuretics cough and hypoglycemia3 Previous studies indicate that Merung has a variety of bioactivity for further study Root extract has antibacterial activity against test bacteria Escherichia coli and Staphylococcus aureus2 Both root and stem extracts are very active as antiplasmodia4 5 While extracts of all parts of plants can be used as an anti inflammatory tonic and can reduce blood glucose levels6 7 Dayak Kenya East Kalimantan since the first harness Merung root as a medicine leucorrhea Leucorrhea is one of the early symptoms of cervical cancer8 Phytochemical screening and toxicity test results show that all parts of Merung contain phenolic and flavonoids and it shows that root is the most toxic against Artemia salina Leach compared to others with LC50 value of 173 09 ppm9 This study aims to measure antioxidant activity and profile chemical compounds of the ethyl acetate fraction METHODE Extraction and separation The dried powder of merung root 6 kg extracted by maceration using methanol for 24 hours repeated two times The obtained filtrate was then evaporated under low pressure with rotavapor and obtained a brown crude extract 164 67 grams The crude extract is redissolved with methanol and then partitioned using n hexane and the partition is continued using ethyl acetate Fractions of n hexane ethyl acetate and methanol were obtained 5 33 61 13 and 71 13 grams respectively Toxicity test The sample toxicity test used the Brine Shrimp Lethality Test against Artemia Salina Leach shrimp larvae9 10 11 Antioxidant activity test The antioxidant activity test was carried out by DPPH radical scavenging method The standard vitamin C solutions were prepared in concentrations of 2 4 6 and 8 µg/mL respectively The sample solution was prepared in concentrations of 20 40 60 and 80 µg/mL respectively 2 mL sample/vitamin C and 2 mL of 0 024 µg / mL DPPH solution was put into the test tube respectively After homogenization the samples were incubated for 30 minutes then measured using a UV Vis Spectrophotometer at the optimum wavelength of 515 nm The same treatment is carried out in making blanks without adding samples % Inhibition = Absorbsorbance of blank Absorbance of sample/vitamin C Absorbance blank ×100% IC50 values were calculated using the linear regression equation Y = a + bX if Y is equal to 50 then the value of X is IC5011 12 13 GC MS Recording The GC MS Shimadzu GCMS QP2010 Plus records the spectrum of active fractions The equipment specification includes the mobile phase of Helium Gas Stationary Phase/Column RTX 5 MS 30M x 0 15 mm ID x 0 25 um The peak obtained from the chromatogram was then compared with the internal database RESULT AND DISCUSSION Based on the extraction and fractionation of crude extracts n hexane fraction ethyl acetate fraction and methanol fraction obtained 164 67 5 33 61 13 and 71 13 grams respectively The toxicity test was performed using the brine shrimp lethality test BSLT method and the LC50 values obtained for a fraction of n hexane ethyl acetate and methanol were 162 28 123 83 and 287 12 µg / mL respectively LC50 values obtained indicate that all extracts are toxic to shrimp Artemia salina L 31<LC50 <1000 ppm However the ethyl acetate fraction has the lowest LC50 value so that it has the highest toxicity compared to the others10 Table 1 Antioxidant activity of extracts of Coptosapelta tomentosa Blume root

Extract _Concentration ppm _Absorbance _% inhibition _IC50 µg/mL _ _ _ Crude _20 _0 213 _19 623 _93 166 _High _ _ _40 _0 188 _29 056 _ _ _ _ _60 _0 169 _36 226 _ _ _ _ _80 _0 147 _44 195 _ _ _ _n hexane _20 _0 161 _39 245 _49 100 _Very high _ _ _40 _0 139 _47 672 _ _ _ _ _60 _0 124 _53 207 _ _ _ _ _80 _0 103 _61 132 _ _ _ _Ethyl acetate _20 _0 145 _45 283 _31 160 _Very high _ _ _40 _0 124 _53 207 _ _ _ _ _60 _0 097 _63 395 _ _ _ _ _80 _0 077 _70 943 _ _ _ _methanol _20 _0 189 _28 678 _83 097 _High _ _ _40 _0 171 _36 138 _ _ _ _ _60 _0 162 _38 867 _ _ _ _ _80 _0 130 _50 817 _ _ _ _Vitamin C _2 _0 220 _16 851 _5 399 _Very high _ _ _4 _0 167 _36 981 _ _ _ _ _6 _0 113 _57358 _ _ _ _ _8 _0

070 _73 635 _ _ _ _ Based on the results of antioxidant activity tests against DPPH radical scavenging IC50 values for crude extracts n hexane ethyl acetate and methanol fractions were 93 166 49 100 31 160 and 83 097 µg / mL respectively Ethyl acetate extract has the smallest IC50 value As a consequence it has the highest antioxidant properties compared to other extracts 14 / Figure 1 GC chromatogram of ethyl acetate fraction of C tomentosa Blume root Table 2 Chemical composition of ethyl acetate fraction of C tomentosa Blume root Peak _Retention Time _Peak Area% _Base peak m/z _Molecule weight _Molecule Formula _Compounds _ _1 _3 166 _0 49 _55 00 _112 _C8H16 _Cyclohexane 1 3 dimethyl _ _2 _3 294 _0 20 _55 05 _112 _C8H16 _Cyclopentane 1 ethyl 3 methyl _ _3 _3 348 _0 22 _55 05 _112 _C8H16 _Cyclopentane 1 ethyl 2 methyl cis _ _4 _3 455 _0 12 _55 05 _112 _C8H16 _Cyclohexane 1 3 dimethyl trans _ _5 _3 567 _0 07 _55 00 _97 _C5H7NO _Acetamide N 2 propynyl _ _6 _10 092 _0 38 _105 00 _382 4 _C20H18N2O6 _Cyclobutane 1 1 dicarboxamide N N' di benzoyloxy _ _7 _11 623 _1 24 _69 05 _154 2493 _C10H18O _2 6 Octadien 1 ol 3 7 dimethyl Z _ _8 _16 473 _0 08 _148 95 _270 71 _C13H15ClO4 _Phthalic acid 2 chloropropyl ethyl ester _ _9 _16 834 _0 16 _139 00 _284 _C18H36O2 _cis 9 10 Epoxyoctadecan 1 ol _ _10 _18 861 _0 09 _124 00 _334 _C21H34O3 _Myristic acid 4 methoxyphenyl ester _ _11 _19 156 _0 31 _55 00 _138 _C10H18 _Cyclooctane ethenyl _ _12 _19 195 _0 24 _123 00 _164 _C10H16Si _Diallyldivinylsilane _ _13 _19 424 _0 43 _97 00 _138 _C9H14O _2 6 Heptadienal 2 4 dimethyl _ _14 _19 638 _0 72 _148 95 _356 _C22H28O4 _1 2 Benzenedicarboxylic acid bis 2 methylpropyl ester _ _15 _19 766 _2 88 _55 05 _238 _C16H30O _7 Hexadecyn 1 ol _ _16 _19 815 _1 14 _133 00 _186 _C11H11NO2 _ 4 isoquinolinol 3 ethoxy _ _17 _19 910 _0 15 _80 00 _95 _CH5NO2S _Methane sulfonamide _ _18 _19 925 _0 16 _95 00 _166 _C11H18O _4 1 2 Dimethyl cyclopent 2 enyl butan 2 one _ _19 _19 975 _0 07 _95 00 _110 _C8H14 _1 4 Pentadiene 2 3 4 trimethyl _ _20 _20 036 _0 76 _69 00 _168 _C10H16O2 _Cyclopropanecarboxylic acid 3 3 butenyl 2 2 dimethyl _ _21 _20 128 _0 12 _57 00 _92 _C4H9Cl _Propane 2 chloro 2 methyl _ _22 _20 241 _0 14 _91 00 _370 _C25H38O2 _9 12 Octadecadienoic acid Z Z phenylmethyl ester _ _23 _20 478 _0 24 _69 05 _156 _C10H20O _Cyclopentaneethanol beta 2 3 trimethyl _ _24 _20 565 _0 09 _57 00 _296 _C10H11F7O2 _3 5 Octanedione 6 6 7 7 8 8 8 heptafluoro 2 2 dimethyl _ _25 _20 642 _0 10 _148 95 _418 _C21H23BrO4 _Phthalic acid 4 bromophenyl heptyl ester _ _26 _20 874 _0 14 _57 00 _254 _C9H19I _Nonane 1 iodo _ _27 _21 442 _0 25 _206 90 _163 _C8H5NO3 _1H Isoindole 1 3 2H dione 2 hydroxy _ _28 _21 700 _0 09 _69 00 _207 _C10H9NO4 _Cyclopropanecarboxylic acid 4 nitrophenyl ester _ _29 _21 801 _0 16 _67 00 _194 _C12H18O2 _1 6 Bis 2 propyn 1 yloxy hexan _ _30 _22 020 _0 10 _57 00 _240 _C8H17I _Octane 1 iodo _ _31 _22 149 _0 28 _189 00 _204 _C14H20O _Lilial _ _32 _22 285 _0 33 _71 00 _152 _C11H20 _4 t Pentylcyclohexene _ _33 _22 375 _0 10 _221 90 _128 _C8H16O _Cyclohexanol 3 5 dimethyl _ _34 _23 385 _0 10 _71 00 _250 _C12H26O3S _Sulfurous acid nonyl 2 propyl ester _ _35 _24 687 _26 31 _69 05 _410 _C30H50 _Squalene _ _36 _25 044 _0 17 _151 00 _236 _C15H12N2O _1 3 Dihydro 5 phenyl 2H 1 4 benzodiazepin 2 one _ _37 _25 385 _0 07 _91 00 _358 _C26H46 _Benzene 1 propylheptadecyl _ _38 _26 260 _0 17 _67 00 _202 _C9H15Br _Cyclohexane 2 bromocyclopropyl trans _ _39 _26 380 _0 44 _96 10 _410 _C30H50 _Olean 12 ene _ _40 _27 131 _32 08 _146 00 _246 _C17H26O _Ethanone 1 1 3 4 4a 5 6 7 hexahydro 2 5 5 trimethyl 2H 2 4a ethanonaphthalen 8 yl _ _41 _27 169 _24 94 _105 05 _246 _C30H50O _Lupeol _ _42 _30 548 _0 14 _81 00 _156 _C9H16O2 _Acetic acid trans 4 methylcyclohexyl ester _ _43 _30 903 _0 74 _67 10 _218 _C4H6N6O5 _Furazan 3 4 diamine N N' dimethyl N N' dinitro _ _44 _31 128 _1 23 _224 95 _254 _C15H10O4 _9 10 Anthracenedione 1 hydroxy 2 hydroxymethyl _ _45 _31 820 _0 15 _133 00 _244 _C12H14ClFO2 _6 Chlorohexanoic acid 3 fluorophenyl ester _ _46 _32 011 _0 33 _148 95 _390 _C24H38O4 _Bis 2 ethylhexyl phthalate _ _47 _34 160 _0 11 _133 00 _252 _C15H16N4 _Bicyclo[2 2 1]heptane 2 5 diphenyl 1 2 4 5 tetraaza _ _48 _34 402 _0 61 _69 10 _362 _C21H30O3S _2 6 10 Dodecatrien 1 ol 3 7 11 trimethyl 9 phenylsulfonyl E E _ _49 _37 280 _0 12 _79 00 _150 _C10H14O _5 6 Epoxy 2 2 dimethyloct 7 ene 3 yne _ _50 _37 433 _0 24 _149 10 _426 _C30H50O _alpha Amyrin _ _ GC MS results on the ethyl acetate fraction obtained major compounds are Ethanone 1 1 3 4 4a 5 6 7 hexahydro 2 5 5 trimethyl 2H 2 4a ethanonaphthalen 8 ol 40 Squalene 35 Lupeol 41 7 Hexadecyn 1 ol 15 2 6 Octadient 1 ol 3 7 dimethyl Z 7 9 10 Anthracenedione 1 hydroxy 2 hydroxymethyl 44 dan 4 isoquinoline 3 ethoxy 16 The 44 is a phenolic compound and the 16 is an aromatic alkaloid which is hydroxyl group substituted both of these compounds have antioxidant potential Characteristics of potent antioxidant compounds have one or more aromatic rings with one or more OH groups capable of donating H11 15 16 In addition other minor aromatic phenolic compounds can also be potential as antioxidants such as Cyclobutane 1 1 dicarboxamide N N' di benzoyloxy 6 Phthalic acid 2 chloropropyl ethyl ester 8 Myristic acid 4 methoxyphenyl ester 10 9 12 Octadecadienoic acid Z Z phenylmethyl ester 22 Phthalic acid 4 bromophenyl heptyl esrter 25 1H Isoindole 1 3 2H dione 2 hydroxy 27 Cyclopropanecarboxylic acid 4 nitrophenyl ester 28 Lilial 31 1 3 Dihydro 5 phenyl 2H 1 4 benzodiazepin 2 one 36 6 Chlorohexanoic acid 3 fluorophenyl ester 45 Bis 2 ethylhexyl phthalate 46 Bicyclo[2 2 1]heptane 2 5 diphenyl 1 2 4 5 tetraaza 47 2 6 10 Dodecatrien 1 ol 3 7 11 trimethyl 9 phenylsulfonyl E E 48 CONCLUSION The ethyl acetate fraction was the most active extract compared to the others for the toxicity test and antioxidant activity test with LC50 and IC50 values of 123 83 µg / mL and 31 160 µg/mL respectively The content profile of the chemical compounds of ethyl acetate fraction shows various types of secondary metabolites Several phenolic or aromatic compounds have been identified The compounds may have antioxidant properties ACKNOWLEDGMENT The authors would like to appreciate and thank the ISDB that has funded this research under contract number 137 / UN 17 11 / PL / 2019 REFERENCE Fitryana 1st International Conference on Tropical Studies and Its Application ICTROPS IOP Conf Series Earth and Environmental Science 144 1 2018 DOI DOI 10 1088/1755 1315/144/1/012020 Hermanda R Widayat W dan Rijai L Prosiding Seminar Nasional Kefarmasian Ke 4 Samarinda 324 2016 Kardinan A Kusuma FR Meniran penambah daya tahan tubuh alami Jakarta Agromedia Pustaka 6 2004 Arnida and Supomo RJPBC 8 43 2017 Arnida Sahi E K and Sutomo Jurnal Ilmiah Ibnu Sina 2 2 270 2017 Minh V V Yen N T K and Thoa P T K Journal of Medicinal Plants Studies 2 3 64 2014 Nugrahani S S 2012 Jurnal Kesehatan Masyarakat 8 1 51 2012 Supriningrum R Sapri dan Pranamala V A Uji 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Nicols D E McLaughlin J L Journal of Medical Plant Research 45 31 1982 Erwin Pusparohmana W R Sari I P Hairani R and Usman F1000Research 7 1977 1 2018 DOI https //doi org/10 12688/f1000research 16643 1 Erwin Indonesia Chimica Acta 8 20 11 2015 Supomo1 Syamsul E S Apriliana A Saleh C Erwin and Lestari D Rasayan J Chem 12 3 1340 1346 2019 DOI http //dx doi org/10 31788/RJC 2019 1235264 P Molyneux J Sci Technol 26 2 211 2004 Brewer M S Comprehensive Reviews in Food Science and Food Safety 10 221 2011 DOI 10 1111/j 1541 4337 2011 00156 x R Kartika R SudrajaT Bustanussalam and P Simanjuntak P Rasayan J Chem 12 3 1022 1026 2019 DOI http //dx doi org/10 31788/RJC 2019 1235186

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1

Isolation and characterization of an anthraquinone derivative from Coptosapelta tomentosa (Blume) root (Merung)

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ABSTRACT

Coptosapelta tomentosa (Blume) (Merung) is a type of tropical plant traditionally being used as a medicine by the Dayak tribes in Indonesia. This experiment aims to identify compounds in the anthraquinone derivative class from the ethyl acetate fraction of the Coptosapelta tomentosa (Blume) root. In this study, an anthraquinone derivative was isolated[1] from the ethyl acetate fraction of Coptosapelta tomentosa root using flash column chromatography. The compound was identified as 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (1). The structure of 1 was established based on Ultraviolet-Visible, Fourier Transformed Infra-Red (FTIR), Nuclear Magnetic Resonance (NMR), and Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF-MS) spectroscopic data. The antitumor and antioxidant activities of this compound were investigated by MTT assay against murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. Antitumor and antioxidant activity test results show that compound 1 may have potent antitumor property but with moderate antioxidant activity.
Keywords: antitumor, antioxidant, Coptosapelta tomentosa, DPPH, traditionally.

INTRODUCTION

Coptosapelta tomentosa (Blume), known locally as Merung or Manuran, is one of the tropical plants found in East Kalimantan, Indonesia. The local community of Dayak Kenyah uses the root of Coptosapelta tomentosa to treat malaria (Arnida et al. 2017). In addition[2], a decoction of the Coptosapelta tomentosa roots is also used[3] to treat parasitic worm infections (Lin 2005). The previous studies indicate that the extract of Coptosapelta tomentosa has several biological activities, i.e., inhibits hem polymerization, shows

antiplasmodial activity (Arnida et al. 2017); (Arnida et al. 2019), has toxicity to Artemia salina (Karolina et al. 2018; Supriningrum et al. 2016), and shows antioxidant activity against DPPH free radical scavenging (Bohari et al. 2019).[4] This experiment aims to identify compounds in the class of anthraquinone derivative from the ethyl acetate fraction of the Coptosapelta tomentosa (Blume) root.

MATERIAL AND METHODS

Plant Material

Coptosapelta tomentosa (Blume) was collected[5] from Tanjung Batu, Tenggarong Seberang District, Kutai Kartanegara, Kalimantan Timur. In the previous report, the plant species was verified[6] by the Plant Anatomy and Systematics Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, UNMUL (Karolina et al. 2018).4

Isolation and Purification

The crude extract of Merung (164.67 g) obtained from the maceration of 6 kg dried powdered roots of Coptosapelta tomentosa (Merung), then partitioned with n-hexane and ethyl acetate to produce fractions of n-hexane (5.33 g), ethyl acetate (61.13 g) and methanol (71.13 g) (Bohari et al. 2019). The ethyl acetate fraction (61.13 g) was subjected to a flash column chromatography using a silica gel 60 (70-230 mesh ASTM) eluted with n-hexane-EtOAc in a polarity gradient method to give six fractions (E1 = 162.9 mg, E2 = 227.4 mg, E3 = 703.1, E4 = 1,898.7 mg, E5 = 2,476.3 mg end E6 = 24,083.3 mg). E4 fraction further fractionated by the same chromatographic method and eluent system, resulting in four derived fractions (E4.1 = 45 mg, E4.2 = 149.3 mg, E4.3 = 200.8 mg, and E4.4 = 695.3 mg). The E4.2 fraction was

purified by recystalization with n-hexane: ethyl acetate (3:7). About 33 grams of compound 1 were obtained.

FTIR, UV-Vis, NMR, and QTof MS Measurements

Infra-Red spectra measurements were carried[7] out using Prestige-21 Fourier Transformed Infra-Red (FTIR) (Shimadzu, Japan). Ultraviolet (UV) spectra were recorded[8] on a UV-Vis spectrophotometer (Variant Cary 100/300, USA). For Nuclear Magnetic Resonance (NMR), the sample was prepared[9] in dimethylsulfoxide (DMSO). NMR spectra were recorded[10] on NMR with a DD2 console system that operates at 500Hz (1H) and 125 MHz (13C) (Agilent, USA). Mass spectra were recorded[11] on Ultra High-Pressure Chromatography coupled with Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF MS) (Xevo G2-XS, Waters Corporation, USA).

Antitumor assay

In vitro MTT (3- (4,5-dimethylthiazol-2-yl) -2,5-diphenyl) cytotoxic assay against murine P-388 leukemia cells measured the antitumor activity of the compound (1) (Alley et al. 1988; Sahidin et al. 2005; Hidayat et al. 2017).

Antioxidant assay with scavenging DPPH Radicals

Compound (1) was dissolved in methanol and made in several concentrations (20, 40, 80, 100 ppm), each solution was put 4 ml into a cuvette, and then added 1 mL of 0.024 µg/mL DPPH solution, homogenized and incubated in a dark room for 30 minutes. Then absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength (508-520 nm). The blanks were made[12] without adding samples. All treatment was performed[13] three times. IC50

determination was conducted[14] using linear regression of %-inhibition versus concentrations (Erwin et al. 2019; Supomo et al. 2019).

RESULT AND DISCUSSION

Compound (1) was obtained[15] as an orange powder with a melting point of 205-208 oC. UPLC/QToF MS spectrum data shows [M-OH] + = 237.0547, according to the molecular formula C15H10O4. The UV-Vis spectrum of compound 1 shows characteristic absorption at λ 253, 279, and 325 nm for the anthraquinone skeleton. UV spectrum data obtained absorption peaks at λmax at 402, 325, 279, and 253 nm. IR absorption peaks were 3263.56, 3076.46, 2927.94, 2854.65, 1635.64 and 1670.35 cm-1. These peaks identified as OH, –C=C–H, aliphatic CH, chelated C=O, and unchelated C=O, respectively. The presence of an OH group in position 1 was shown by absorption at λmax of 402 nm. The peak supported the evidence at 3263.56 cm-1 in the FT-IR spectrum and 12.74 ppm (s, 1H) in 1H-NMR. The absorption of 1635.64 and 1670.35 cm-1 in the FTIR spectrum shows the presence of chelated and unchelated quinone carbonyls (Ee et al. 2009). The absorption bands indicated the presence of aromatic and aliphatic CH group in the FTIR spectrum at 3076.46 (aromatic CH), 2927.94, and 2854 cm-1 (aliphatic CH), respectively.

The presence of the –CH2-OH group indicated when the proton signaled at 4.64 ppm (d, J = 12 Hz, 2H) (H-11) coupled with a signal at 5.44 ppm (t, J = 11.0 Hz, OH), and attached to C-11 (57.39 ppm). HMBC spectrum data shows that H-11 has a long-distance correlation with carbon at C-1, C-2, C-3, and C-4, so that the -CH2-OH group attached to C-2. The doublet signaled at 7.89 ppm (d, J = 15.6 Hz) (H-3) was coupled to 7.74 ppm (d, J = 17.9 Hz) (4). The H-NMR spectrum of compound 1 also showed peaks at 8.17 ppm (d, J = 7.0 Hz, 1H) (5), 7.93 ppm (t, J = 6.2; 7.4 Hz, 2H) (5 and 6) and 8.22 ppm (d, J = 6.8 Hz, 1H) (Table

1). These peaks implied the existence of unsubstituted C rings. The absorption pattern in the H and C-NMR spectrum of the ring C of compound 1 is similar to the ring C of 2-ethoxy-1-hydroxyanthraquinone (Ee et al. 2009). Based on UV, IR, 1D-2D-NMR, QToF MS data, and compared with the NMR literature data (Kuo et al. 1995), it was concluded that compound 1 was 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (Figure 1).
The 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione has an IC50 value of 6.87 µg/mL in the MTT assay against murine leukemia P-388 cells and IC50 value of the antioxidant activity of 26.30 µg/mL against DPPH free radical.

CONCLUSION

The 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) has been isolated[16] from the ethyl acetate fraction of the Coptosapelta tomentosa root. Antitumor and antioxidant activity test results showed that 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dion (1) has significant antitumor activity potential, but its antioxidant activity was moderate with IC50 values of 6.87 and 26.30 µg / mL, respectively.

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REFERENCE

Alley MC, Scudiero DA, Monks A, Hursey ML, Czerwinski MJ, Fine DL, Abbot BJ, Mayo JG, Shoemaker RH, Boyd MR (1988) Feasibility of Drug Screening with

Panels of Human Tumor Cell Lines Using a Microculture Tetrazolium Assay. Cancer Research 48: 589-601.

Arnida, Sahi EK, Sutomo (2017) Aktivitas Antiplasmodium In vitro Dan Identifikasi Golongan Senyawa Dari Ekstrak Etanol Batang Manuran (Coptosapelta tomentosa Valeton ex K.Heyne) Asal Kalimantan Selatan. Jurnal Ilmiah Ibnu Sina 2(2): 270 – 278. https://doi.org/10.36387/jiis.v2i2.119

Arnida, Sutomo, Rusyida L (2019) Aktivitas Penghambatan Polimerasi Hem Dari Fraksi Etil Asetat Daun Manuran, Coptosapelta tomentosa Valeton ex K.Heyne (Rubiaceae). Jurnal Fitofarmaka Indonesia 6(1): 309-314. http://10.33096/jffi1.459

Bohari, Karolina A, Pratiwi DR, Erwin, Rahmadi A (2019) Toxicity test, antioxidant activity test, and GC-MS profile of the active fraction of Coptosapelta tomentosa (Blume) root (Merung). Eurasian Journal of Biosciences 13(2): 2403-2406.

Ee GCL, Wen YP, Sukari MA, Go R, Lee HL (2009) A new anthraquinone from Morinda citrifolia roots. Natural Product Research 23(14): 1322–1329.

Erwin, Pusparohmana WR, Sari IP, Hairani R, Usman (2019) GC-MS profiling and DPPH radical scavenging activity of the bark of Tampoi (Baccaurea macrocarpa). F1000Research 7(1977): 1-8. https://doi.org/10.12688/f1000research.16643.2

Hidayat AC, Farabi K, Harneti D, Nurlelasari, Maharani R, Mayanti T, Supratman U, Shiono Y (2017) A Cytotoxic Rocaglate Compound from The Stem bark of Aglaia argentea (Meliaceae). Molekul 2(2): 146 – 152. http://10.20884/1.jm.2017.12.2.361

Karolina A, Pratiwi DR, Erwin (2018) Phytochemical and Toxicity Test of Merung Extracts. Jurnal Atomik 03(2): 79-82

Kuo SC, Chen PR, Lee SW, Chen ZT (1995) Constituents of Roots of Rubia lanceolata Hayata. Journal of the Chinese Chemical Society 42: 869-871. https://doi.org/10.1002/jccs.1995 00117

Lin KW (2005) Ethnobotanical Study Of Medical Plants Used By The Jah Hut Peoples In Malaysia. Indian Journal of Medical Sciences 59(4): 156-161.

Sahidin, Hakim EH, Juliawaty LD, Syah YM, Din L, Ghisalberti EL, Latip J, Said IM, Achmad SA (2005) Cytotoxic Properties of Oligostilbenoids from the Tree Barks of Hopea dryobalanoides. Z. Naturforsch 60(c): 723-727. https://doi.org/10.1515/znc-2005-9-1011

Supomo, Syamsul ES, Apriliana A, Saleh C, Erwin, Lestari D (2019) Antioxidant Assay of Dayak Onion (Eleutherine palmifolia) via DPPH (1,1-Difenil-2-Pikrilhidrazil) and BSLT Test for its Active Fraction. Rasayan Journal of Chemistry 12(3): 1340-1346. http://dx.doi.org/10.31788/RJC.2019.1235264

Supriningrum R, Sapri, Pranamala VA (2016) Uji Toksisitas Akut Ekstrak Etanol Akar KB (Coptosapelta tomentosa Valeton ex K.Heyne) dengan Metode Brine Shrimp Lethality Test (BSLT). Jurnal Ilmiah Manuntung 2(2): 161-165.

Table 1. 1H- and 13C-NMR Spectroscopic data of compound 1

No

Chemical Shift (ppm)

HMBC (1H ®13C)

13C-NMR

13C-NMR

(Kuo et al. 1995)

1H-NMR

1H-NMR

(Kuo et al. 1995)

1-OH

158.35

158.64

12.74 (s; 1H)

12.55 (s; 1H)

C-1, C-11

2

131.24

137.58

-

-

3

133.53

133.07

7.89 (d, J = 7.8 Hz; 1H)

7.50 (m; 1H)

C-1, C-2, C-4, C-11

4

118.81

118.36

7.74 (d, J = 8.9 Hz; 1H)

7.58 (l H, d, J= 8.0 Hz)

C-3,C-4a, C-9,C-9a ,C-10

4a

138.25

130.79

-

-

5

126.82

126.37

8.17 (d, J = 7.0Hz;1H)

7.94 (m; 1H)

C-6, C-8a, C-10, C-10a

6

134.53

133.92

7.93 (t, J = 6.2, 7.4 Hz; 1H)

7.50 (m; 1H)

C-5, C-8,C-10a

7

135.12

133.33

7.93 (t, J = 6.2, 7.4 Hz; 1H)

7.50 (m; 1H)

C-5, C-8,C-10a

8

126.53

125.98

8.22 (d, J = 6.8 Hz; 1H)

7.94 (m; 1H)

C-6, C-9

8a

133.18

132.30

-

-

9

188.62

188.08

-

-

9a

114.83

114.20

-

-

10

181.71

181.35

-

-

10a

132.75

132.80

-

-

11

57.39

57.69

4.64 (d, J = 6.0 Hz; 2H)

4.46 (d, J = 5.6 Hz; 2H)

C-1, C-2, C-3, C-4,

11-OH

-

5.44 (t, J = 5.5 Hz; 1H)

4.62 (t, J = 5.6 Hz, 1H)

C-11

Figure 1. The structural compound of Digiferruginol from Coptosapelta tomentosa

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7.	*were carried*	Passive Voice Misuse	Clarity
8.	*were recorded*	Passive Voice Misuse	Clarity
9.	*was prepared*	Passive Voice Misuse	Clarity
10.	*were recorded*	Passive Voice Misuse	Clarity
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> > > > >
> > > > > Last year we reported toxicity test, antioxidant activity test and GC-MS profile of the active fraction of

Coptosapelta tomentosa (Blume) root (Merung), resulting in several compound identified as Ethanone, 1-(1,3,4,4a, 5,6,7-hexahydro-2,5,5-trimethyl-2H- 2,4a-ethanonaphthalen-8-ol) - (32.08%), Squalene (26%), Lupeol (24.94%), 7-Hexadecyn-1-ol (2.88%), 2,6-Octadien-1-ol, 3,7-dimethyl-, (Z) - (1.24%), 9,10-Anthracenedione, 1-hydroxy-2- (hydroxymethyl) - (1.23%), and 4-isoquinoline, 3-ethoxy- (1.14%). 9,10-Anthracenedione, 1-hydroxy-2- (hydroxymethyl)- and 4-isoquinoline, 3-ethoxy-. The article was published in Eurasian Journal of Biosciences 13(2): 2403-2406, 2019.
As a continuation of the research, this article aimed to identify pure compound in the class of anthraquinone derivative from the ethyl acetate fraction of Coptosapelta tomentosa (Blume) root, namely 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol). The structure of the compound was established based on Ultraviolet Visible, Fourier Transformed Infra-Red (FTIR), Nuclear Magnetic Resonance (NMR), and Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF-MS) spectroscopic data.
The compound has potent antitumor properties but with moderate antioxidant activity against murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. We hope that this article will add a significant contribution to the anti-tumor compound collections from the biodiversity of the plants.

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Best regards,

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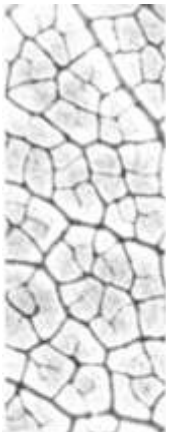

EurAsian Journal of BioSciences
Eurasia J Biosci 14, 1-4 (2020)

An anthraquinone derivative *from Coptospella tomentosa* (Blume) root (Merung)

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Abstract
Coptosapelta tomentosa (Blume) (*Merung*) is a type of tropical plants traditionally being used as a medicine by the Dayak tribes in Indonesia. This experiment aims to identify compound in the class of anthraquinone derivative from the ethyl acetate fraction of *Coptosapelta tomentosa* (Blume) root. In this study, an anthraquinone derivative was isolated from the ethyl acetate fraction of *Coptosapelta tomentosa* root using flash column chromatography. The compound was identified as 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (digiferruginol) (1). The structure of 1 was established based on Ultraviolet Visible, Fourier Transformed Infra-Red (FTIR), Nuclear Magnetic Resonance (NMR), and Quadrupole Time-of-Flight Mass Spectrometry (UPLC/QToF-MS) spectroscopic data. The antitumor and antioxidant activities of this compound were investigated by MTT assay against murine leukemia P-388 cells and DPPH free radical scavenging method, respectively. Antitumor and antioxidant activity test results show that compound 1 may have potent antitumor property but with moderate antioxidant activity.

Keywords: antitumor, antioxidant, *Coptosapelta tomentosa,* DPPH, traditionally.

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INTRODUCTION

Coptosapelta tomentosa (Blume), known locally as *Merung* or *Manuran*, is one of the tropical plants found in East Kalimantan, Indonesia. The local community of Dayak Kenyah uses the root of *Coptosapelta tomentosa* to treat malaria (Arnida et al. 2017). In addition, a decoction of the *Coptosapelta tomentosa* roots is also used to treat parasitic worm infections (Lin 2005). The previous studies indicate that the extract of *Coptosapelta tomentosa* has several biological activities, i.e., inhibits hem polymerization, shows antiplasmodial activity (Arnida et al. 2017; Arnida et al. 2019), has toxicity to *Artemia salina* (Karolina et al. 2018; Supriningrum et al. 2016), and shows antioxidant activity against DPPH free radical scavenging (Bohari et al. 2019).

This experiment aims to identify compounds in the class of anthraquinone derivative from the ethyl acetate fraction of the *Coptosapelta tomentosa* (Blume) root.

MATERIAL AND METHODS

Isolation and Purification

The crude extract of *Merung* (164.67 g) obtained from the maceration of 6 kg dried powdered roots of *Coptosapelta tomentosa* (*Merung*), then partitioned with n-hexane and ethyl acetate to produce fractions of n-hexane (5.33 g), ethyl acetate (61.13 g) and methanol (71.13 g) (Bohari et al. 2019).

The ethyl acetate fraction (61.13 g) was subjected to a flash column chromatography using a silica gel 60 (70-230 mesh ASTM) eluted with *n*-hexane-EtOAc in a polarity gradient method to give six fractions (E_1 = 162.9 mg, E_2 = 227.4 mg, E_3 = 703.1, E_4 = 1,898.7 mg, E_5 = 2,476.3 mg end E_6 = 24,083.3 mg). E_4 fraction further fractionated by the same chromatographic method and eluent system, resulting in four derived fractions ($E_{4.1}$ = 45 mg, $E_{4.2}$ = 149.3 mg, $E_{4.3}$ = 200.8 mg, and $E_{4.4}$ = 695.3 mg). The $E_{4.2}$ fraction was purified by recystalization with *n*-hexane: ethyl acetate (3:7). About 33 grams of compound 1 were obtained.

Antitumor Assay

In vitro MTT (3- (4,5-dimethylthiazol-2-yl) -2,5-diphenyl) cytotoxic assay against murine P-388

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leukemia cells measured the antitumor activity of the compound (1) (Alley et al. 1988; Sahidin et al. 2005; Hidayat et al. 2017).

Antioxidant assay with scavenging DPPH Radicals

Compound (1) was dissolved in methanol and made in several concentrations (20, 40, 80, 100 ppm), each solution was put 4 ml into a cuvette, and then added 1 mL of 0.024 µg/mL DPPH solution, homogenized and incubated in a dark room for 30 minutes. Then absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength (508-520 nm). The blanks were made without adding samples. All treatment was performed three times. IC_{50} determination was conducted using linear regression of %-inhibition versus concentrations (Erwin et al. 2019; Supomo et al. 2019).

RESULT AND DISCUSSION

Compound (1) was obtained as an orange powder with a melting point of 205-208 ^{o}C. UPLC/QToF MS spectrum data shows $[M\text{-}OH]^{+}$ = 237.0547, according to the molecular formula $C_{15}H_{10}O_4$. The UV-Vis spectrum of compound 1 shows characteristic absorption at λ 253, 279, and 325 nm for the anthraquinone skeleton. UV spectrum data obtained absorption peaks at λ_{max} at 402, 325, 279, and 253 nm. IR absorption peaks were 3263.56, 3076.46, 2927.94, 2854.65, 1635.64 and 1670.35 cm^{-1}. These peaks identified as OH, –**C**=**C**–H, aliphatic CH, chelated C=O, and unchelated C=O, respectively. The presence of an OH group in position 1 was shown by absorption in UV spectrum at λ_{max} of 402 nm. The peak supported the evidence at 3263.56 cm^{-1} in the FT-IR spectrum and 12.74 ppm (s, 1H) in ^{1}H-NMR. The absorption of 1635.64 and 1670.35 cm^{-1} in the FTIR spectrum shows the presence of chelated and unchelated quinone carbonyls (Ee et al. 2009). The absorption bands indicated the presence of aromatic and aliphatic CH group in the FTIR spectrum at 3076.46 (aromatic CH), 2927.94, and 2854 cm^{-1} (aliphatic CH), respectively.

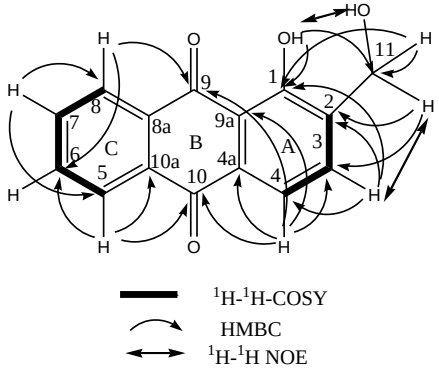

Fig. 1. The structural of 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (Digiferruginol) (1)

The presence of the $–CH_2$-OH group indicated when the proton signaled at 4.64 ppm (d, *J* = 12 Hz, 2H) (H-11) coupled with a signal at 5.44 ppm (t, *J* = 11.0 Hz, OH), and attached to C-11 (57.39 ppm). HMBC spectrum data shows that H-11 has a long-distance correlation with carbon at C-1, C-2, C-3, and C-4, so that the -CH_2-OH group attached to C-2. The doublet signaled at 7.89 ppm (d, *J* = 15.6 Hz) (H-3) was coupled to 7.74 ppm (d, *J* = 17.9 Hz) (4). The H-NMR spectrum of compound 1 also showed peaks at 8.17 ppm (d, *J* = 7.0 Hz, 1H) (5), 7.93 ppm (t, *J* = 6.2; 7.4 Hz, 2H) (5 and 6) and 8.22 ppm (d, *J* = 6.8 Hz, 1H) (Table 1). These peaks implied the existence of unsubstituted C rings. The absorption pattern in the H and C-NMR spectrum of the ring C of compound 1 is similar to the ring C of 2-ethoxy-1-hydroxyanthraquinone (Ee et al. 2009). Based on UV, IR, 1D-2D-NMR, QToF MS data, and compared with the NMR literature data (Kuo et al. 1995), it was concluded that compound 1 was 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (digiferruginol) (Figure 1).

The 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione (digiferruginol) has an IC_{50} value of 6.87 µg/mL in the MTT assay against murine leukemia P-388 cells and IC_{50} value of the antioxidant activity of 26.30 µg/mL against DPPH free radical.

Table 1. ^{1}H- and ^{13}C-NMR Spectroscopic data of 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (digiferruginol) (1)

No	Chemical Shift (ppm)				HMBC (^{1}H →^{13}C)
	^{13}C-NMR	^{13}C-NMR (Kuo et al. 1995)	^{1}H-NMR	^{1}H-NMR (Kuo et al. 1995)	
1-OH	158.35	158.64	12.74 (s; 1H)	12.55 (s; 1H)	C-1, C-11
2	131.24	137.58	-		-
3	133.53	133.07	7.89 (d, *J* = 7.8 Hz; 1H)	7.50 (m; 1H)	C-1, C-2, C-4, C-11
4	118.81	118.36	7.74 (d, *J* = 8.9 Hz; 1H)	7.58 (l H, d, *J*= 8.0 Hz)	C-3,C-4a, C-9,C-9a ,C-10
4a	138.25	130.79	-		-
5	126.82	126.37	8.17 (d, *J* = 7.0Hz;1H)	7.94 (m; 1H)	C-6, C-8a, C-10, C-10a
6	134.53	133.92	7.93 (t, *J* = 6.2, 7.4 Hz; 1H)	7.50 (m; 1H)	C-5, C-8,C-10a
7	135.12	133.33	7.93 (t, *J* = 6.2, 7.4 Hz; 1H)	7.50 (m; 1H)	C-5, C-8,C-10a
8	126.53	125.98	8.22 (d, *J* = 6.8 Hz; 1H)	7.94 (m; 1H)	C-6, C-9
8a	133.18	132.30	-		-
9	188.62	188.08	-		-
9a	114.83	114.20	-		-
10	181.71	181.35	-		-
10a	132.75	132.80	-		-
11	57.39	57.69	4.64 (d, *J* = 6.0 Hz; 2H)	4.46 (d, *J* = 5.6 Hz; 2H)	C-1, C-2, C-3, C-4,
11-OH	-	-	5.44 (t, *J* = 5.5 Hz; 1H)	4.62 (t, *J* = 5.6 Hz, 1H)	C-11

CONCLUSION

The 1-hydroxy-2-(hydroxymethyl) anthracene-9,10-dione (digiferruginol) has been isolated from the ethyl acetate fraction of the *Coptosapelta tomentosa* root. Antitumor and antioxidant activity test results showed that 1-hydroxy-2- (hydroxymethyl) anthracene-9,10-dione (1) has significant antitumor activity potential, but its antioxidant activity was moderate with IC_{50} values of 6.87 and 26.30 µg / mL, respectively.

ACKNOWLEDGEMENTS

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REFERENCES

Alley MC, Scudiero DA, Monks A, Hursey ML, Czerwinski MJ, Fine DL, Abbot BJ, Mayo JG, Shoemaker RH, Boyd MR (1988) Feasibility of Drug Screening with Panels of Human Tumor Cell Lines Using a Microculture Tetrazolium Assay. Cancer Res. 48: 589-601.

Arnida, Sahi EK, Sutomo (2017) Aktivitas Antiplasmodium In vitro Dan Identifikasi Golongan Senyawa Dari Ekstrak Etanol Batang Manuran (*Coptosapelta tomentosa* Valeton ex K.Heyne) Asal Kalimantan Selatan. Jurnal Ilmiah Ibnu Sina, 2 (2): 270 – 278. https://doi.org/10.36387/jiis.v2i2.119

Arnida, Sutomo, Rusyida L (2019) Aktivitas Penghambatan Polimerasi Hem Dari Fraksi Etil Asetat Daun Manuran, *Coptosapelta tomentosa* Valeton ex K.Heyne (Rubiaceae). JFFI, 6(1): 309-314. http://10.33096/jffi1.459

Bohari, Karolina A, Pratiwi DR, Erwin, Rahmadi A (2019) Toxicity test, antioxidant activity test and GC-MS profile of the active fraction of *Coptosapelta tomentosa* (Blume) root (Merung). Eurasia J. Biosci.13(2): 2403-2406.

Ee GCL, Wen YP, Sukari MA, Go R, Lee HL (2009) A new anthraquinone from *Morinda citrifolia* roots. Natural Product Research, 23(14): 1322–1329.

Erwin, Pusparohmana WR, Sari IP, Hairani R, Usman, (2019) GC-MS profiling and DPPH radical scavenging activity of the bark of Tampoi (*Baccaurea macrocarpa*). F1000Research, 7(1977): 1-8. https://doi.org/10.12688/f1000research.16643.2

Hidayat AC, Farabi K, Harneti D, Nurlelasari, Maharani R, Mayanti T, Supratman U, Shiono Y (2017) A Cytotoxic Rocaglate Compound from The Stem bark of Aglaia argentea (Meliaceae). *Molekul*, 2(2): 146 – 152. http://10.20884/1.jm.2017.12.2.361

Karolina A, Pratiwi DR, Erwin (2018) Phytohemical and Toxicity Test of Merung Extracts. Jurnal Atomik, 03(2): 79-82

Kuo SC, Chen PR, Lee SW, Chen ZT (1995) Constituents of Roots of Rubia lanceolata Hayata. Journal of the Chinese Chemical Society, 42: 869-871. https://doi.org/10.1002/jccs.199500117

Lin KW (2005) Ethnobotanical Study Of Medical Plants Used By The Jah Hut Peoples In Malaysia. Indian J. Medical Sci. 59(4): 156-161.

Sahidin, Hakim EH, Juliawaty LD, Syah YM, Din L, Ghisalberti EL, Latip J, Said IM, Achmad SA (2005) Cytotoxic Properties of Oligostilbenoids from the Tree Barks of Hopea dryobalanoides. Z. Naturforsch, 60(c): 723-727. https://doi.org/10.1515/znc-2005-9-1011

Supomo, Syamsul ES, Apriliana A, Saleh C, Erwin, Lestari D (2019) Antioxidant Assay of Dayak Onion (Eleutherine palmifolia) via DPPH (1,1-Difenil-2-Pikrilhidrazil) and BSLT Test for its Active Fraction. Rasayan J. Chem. 12(3): 1340-1346. http://dx.doi.org/10.31788/RJC.2019.1235264

Supriningrum R, Sapri, Pranamala VA (2016) Uji Toksisitas Akut Ekstrak Etanol Akar KB (*Coptosapelta tomentosa*Valeton ex K.Heyne) dengan Metode Brine Shrimp Lethality Test (BSLT). Jurnal Ilmiah Manuntung, 2(2): 161-165.