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24-Methylenecycloartanol Isolated from The Fruit Peel of Matoa (*Pometia pinnata*) and Its Activity as an Antibacterial against *Staphylococcus aureus* and *Escherichia coli*

Risyandi Anwar[1], Steffi Triany Arnov[2], Ghesta Alifka Putri[3], Siska Elisahbet Sinaga[4], Al Arofatus Naini[5], Unang Supratman[3,4]*

[1]Herbal Medicine Research, Department of Pediatric Dentistry, Faculty of Dental Medicine, University of Muhammadiyah Semarang, Jl. Kedungmundu No.18, Kedungmundu, Kec. Tembalang, Kota Semarang, Jawa Tengah 50273 Semarang 50272, Indonesia
[2]Department of Periodontal, Faculty of Dental Medicine, University of Muhammadiyah Semarang, Jl. Kedungmundu No.22, Sendangmulyo, Kec. Tembalang, Kota Semarang, Jawa Tengah 50272
[3]Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, Jl. Raya Bandung-Sumedang Km. 21, Jatinangor, Sumedang 45363, Indonesia
[4]Central Laboratory of Universitas Padjadjaran, Jl. Raya Bandung-Sumedang Km. 21, Jatinangor, Sumedang 45363, Indonesia
[5]Research Center for Pharmaceutical Ingredients and Traditional Medicine, National Research and Innovation Agency (BRIN), Cibinong Science Center Complex – BRIN, Cibinong 16911, Bogor, West Java, Indonesia
*Corresponding author: unang.supratman@unpad.ac.id

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Abstract: Triterpenoids are compounds with highly diverse chemical structures and exhibit interesting biological activities such as antiviral, antibacterial, anti-inflammatory, and anticancer properties. The matoa plant (*Pometia pinnata*), belonging to the genus *Pometia* from the family Sapindaceae, has been used in traditional medicine and shows potential as an antibacterial agent. The purpose of this research was to isolate and determine the chemical structure of triterpenoids from the peel of the matoa fruit (*P. pinnata*) and to evaluate their antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*. The ethyl acetate extract from the peel of *P. pinnata* demonstrated significant antibacterial activity. In this study, a triterpenoid compound was identified, and its chemical structure was determined using spectroscopic methods, including UV, IR, MS, ^{1}H-NMR, ^{13}C-NMR, and 2D-NMR, as well as by comparing data from the literature. The compound was identified as a cycloartane-type triterpenoid known as 24-methylenecycloartanol. The compound was then tested for antibacterial activity against *S. aureus* and *E. coli*. The test results showed a minimum inhibitory concentration (MIC) of 500 µg/mL for both bacteria, which was categorized as very weak

Keywords: antibacterial, *Escherichia coli*, *Pometia pinnata*, *Staphylococcus aureus*, triterpenoid

Abstrak:. *Triterpenoid merupakan senyawa dengan struktur kimia yang sangat beragam dan menunjukkan aktivitas biologis yang menarik seperti antivirus, antibakteri, anti-inflamasi, dan antikanker. Tumbuhan matoa (Pometia pinnata) yang termasuk dalam genus Pometia dari famili Sapindaceae telah dimanfaatkan sebagai obat tradisional dan berpotensi sebagai antibakteri. Tujuan dari penelitian ini adalah mengisolasi dan menentukan struktur kimia triterpenoid dari kulit buah matoa (P. pinnata) dan menentukan aktivitas antibakteri terhadap Staphylococcu aureu dan Escherichia coli. Ekstrak etil asetat dari kulit buah P. pinnata menghasilkan aktivitas antibakteri yang signifikan. Hasil penelitian ini ditemukan senyawa triterpenoid yang struktur kimianya ditentukan berdasarkan metode spektroskopi meliputi UV, IR, MS, ^{1}H-NMR, ^{13}C-NMR, dan 2D-NMR serta perbandingan dengan data dari literatur, diidentifikasikan sebagai senyawa triterpenoid tipe sikloartan yaitu 24-metilensikloartanol. Selanjutnya senyawa tersebut diuji aktivitas antibakteri terhadap S. aureus dan E. coli. Hasil pengujian kedua bakteri menunjukkan nilai MIC sebesar 500 µg/mL dan dikategorikan sangat lemah*.

Kata kunci: *antibakteri, Escherichia coli, Pometia pinnata, Staphylococcus aureus,triterpenoid*

INTRODUCTION

Pometia pinnata J.R. & G. Forst, widely known as matoa, is a distinctive plant native to Papua known for its economic and health benefits. Its fruit combines unique flavors reminiscent of rambutan, longan, and durian, making it popular in the region (Darmastuti *et al*. 2024; Adrian *et al*. 2021) Traditionally, various parts of the matoa plant have been utilized for medicinal purposes (Suedee *et al*. 2013; Styani *et al*. 2021), including its fruit peel, which contains various secondary metabolites such as alkaloids, flavonoids, terpenoids, and vitamins (Rohmawati & Sutoyo 2018; Pamangin *et al*. 2020; Maryam *et al*. 2020). While some studies have shown antibacterial activity in various matoa plant extracts against pathogens like *Staphylococcus aureus* and *Escherichia coli* (Janatiningrum *et al*. 2024; Sidoretno, 2021; Rossalinda *et al*. 2021; Faustina & Filiana 2014; Ngajow *et al*. 2013). Research on *Pometia pinnata* (matoa) has yielded a very limited number of secondary metabolite compounds thus far. Only nine secondary metabolites have been reported, including compounds like pometin and stigmasterol from the bark, and proanthocyanidin A2, flavonoids such as epicatechin, kaempferol-3-*O*-rhamnoside, and quercetin-3-*O*-rhamnoside from the leaves. Additionally, compounds like 1-*O*-palmitoyl-3-*O*-[α-D-galactopyranosyl-(1→6)-β-D-galactopyranosyl]-sn-glycerol, stigmasterol-3-*O*-glucoside, and 3-*O*-α-L-arabinofuranosyl-(1→3)-[α-L-rhamnopyranosyl-(1→2)]-α-L-arabinopyranosyl hederagenin have also been identified in the leaves. This limited report underscores the current scarcity of research on secondary metabolites from matoa, especially in triterpenoid.

Triterpenoids are a group of compounds with significant pharmacological potential, including as antibacterial agents (Toll 2014). Amid concerns over increasing antibiotic resistance worldwide, the development of local natural resources such as the matoa plant for discovering new antibacterial compounds is becoming increasingly important (Setyaningsih *et al*. 2020; Hidayat *et al*. 2017). Therefore, this study aims to explore the potential of triterpenoid compounds from matoa fruit peel as antibacterial agents. It is hoped that this research will contribute to the enhanced use of local natural resources for alternative medicine and support global efforts in addressing antibiotic resistance challenges.

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MATERIALS AND METHODS

Materials

Preparation and Maceration: The fruit peel of *P. pinnata* was collected from Papua, Indonesia. The bark was dried in the central laboratory of Universitas Padjadjaran. Organic solvents were used including ethanol, ethyl acetate, *n*-butanol, methanol, *n*-hexane, methylene chloride, chloroform and acetone purchased from Kristata Gemilang Company, Bandung. The dried matoa fruit peel powder as much as 1.1 kg was extracted using maceration method with 96% ethanol solvent repeatedly at room temperature. The macerate was filtered, separated, and concentrated using a rotary evaporator at 40°C to obtain 234.4 g of concentrated ethanol extract. Subsequently, the concentrated ethanol extract was dissolved in water and successively partitioned with *n*-hexane, ethyl acetate, and *n*-butanol at room temperature. Each macerate was separated and concentrated using a rotary evaporator at 40°C to obtain *n*-hexane, ethyl acetate, and *n*-butanol extracts, yielding 1.0 g, 13.9 g, and 13.4 g respectively. Each extract was then tested for antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*, with the ethyl acetate extract showing the strongest antibacterial activity.

Instrument

A Perkin Elmer Spectrum 100 FT-IR spectrometer was used to record the IR spectra. A Waters Q-TOF Xevo mass spectrometer was applied to acquire mass spectra. The NMR spectrum of compound **1** was examined using a JEOL JNM-ECX500R/S1 spectrometer running at 500 MHz for ^{1}H and 125 MHz for ^{13}C. The column chromatography was carried out using Merck's 70–230 and 230–400 mesh silica gel G_{60}. TLC studies were carried out using different solvent solutions with silica GF_{254} (Merck, 0.25 mm). Spot detection was achieved by spraying the area first with 10% H_2SO_4 in ethanol and then exposing it to UV-visible light (254 and 365 nm).

Isolation, Purification, and Elucidation

The concentrated ethyl acetate extract, which exhibited the strongest antibacterial activity, was separated using vacuum liquid chromatography (VLC) with silica gel G_{60} (70-230 mesh) as the stationary phase and *n*-hexane acetate and ethyl acetate (10% gradient) as the mobile phases, resulting in twelve combined fractions (A-L). Fraction C (0.18 g) was further separated using open column chromatography with silica gel G_{60} (230-400 mesh) and *n*-hexane acetate (9:1) as the eluent, yielding fourteen combined fractions (C1-C14). Fraction C3 (28.0 mg) was isolated using open column chromatography on ODS with methanol (9:1) as the eluent, resulting in a pure isolate weighing 5.1 mg. Each stage was monitored using thin-layer chromatography (TLC), detected under UV light at λ 254 and 365 nm, and visualized with 10% sulfuric acid in ethanol by heating on a hotplate. Purity testing was performed using TLC on silica gel plates with two solvent systems, three solvent systems, and two-dimensional systems, as well as on ODS plates. Pure isolate clarified by NMR, DEPT-135, 2D-NMR, HR-TOFMS, and spectroscopic infrared.

Antibacterial Activity Test against *S. aureus* and *E. coli*

The determination of antibacterial activity was conducted based on a previously reported method (Permata *et al*. 2016; Sinaga *et al*. 2023[a]). Bacterial preparations (*Staphylococcus aureus and Escherichia coli*) were cultured on agar media by streaking and then incubated at 37°C for 24 hours. The turbidity of the bacterial suspension was adjusted to match the McFarland standard. Two reaction tubes were prepared as positive controls with the McFarland standard and as negative controls (containing the highest sample concentration at 100 mg/L). Subsequent tubes contained varying sample concentrations diluted in a 1:2 serial dilution (w/v). Testing involved transferring 0.5 mL of standardized bacterial suspension to each reaction tube, measuring the initial absorbance using a UV-Vis spectrophotometer. The incubation was repeated twice for 24 hours, visually observing turbidity. Continued growth was indicated if the visual turbidity matched the positive control; however, if clarity began to appear compared to the positive control, bacterial growth was inhibited. Final absorbance values were measured using a UV-Vis spectrophotometer. An increase in absorbance from initial to final indicated bacterial growth, while a decrease indicated inhibition of bacterial growth (*Staphylococcus aureus* and *Escherichia coli*) (Sinaga *et al*. 2023b).

RESULTS AND DISCUSSION

The concentrated ethanol, *n*-hexane, ethyl acetate, *n*-butanol, and aqueous fractions were evaluated for their antibacterial activity against *S. aureus* and *E. coli*. The antibacterial activity categories were based on the minimum inhibitory concentration (MIC) values: MIC values less than 100 µg/mL indicate very strong antibacterial activity, MIC values of 100-500 µg/mL indicate moderate to strong antibacterial activity, MIC values of 500-1000 µg/mL indicate weak antibacterial activity, and MIC values greater than 1000 µg/mL indicate no antibacterial activity (Salni *et al*. 2011). The results of the extract activity tests can be found in Table 1.

Based on the obtained MIC values, overall, for *S. aureus* showed lower MIC values compared to *E. coli*, indicating a greater inhibition of *S. aureus* than *E. coli*. Specifically, in the individual extract tests, the ethyl acetate extract exhibited the best MIC values, with 39.063 µg/mL for *S. aureus* and 78.125 µg/mL for *E. coli*. These MIC values being less than 100 µg/mL categorize the antibacterial activity of the ethyl acetate extract as very strong. Therefore, the ethyl acetate extract will proceed to the isolation method.

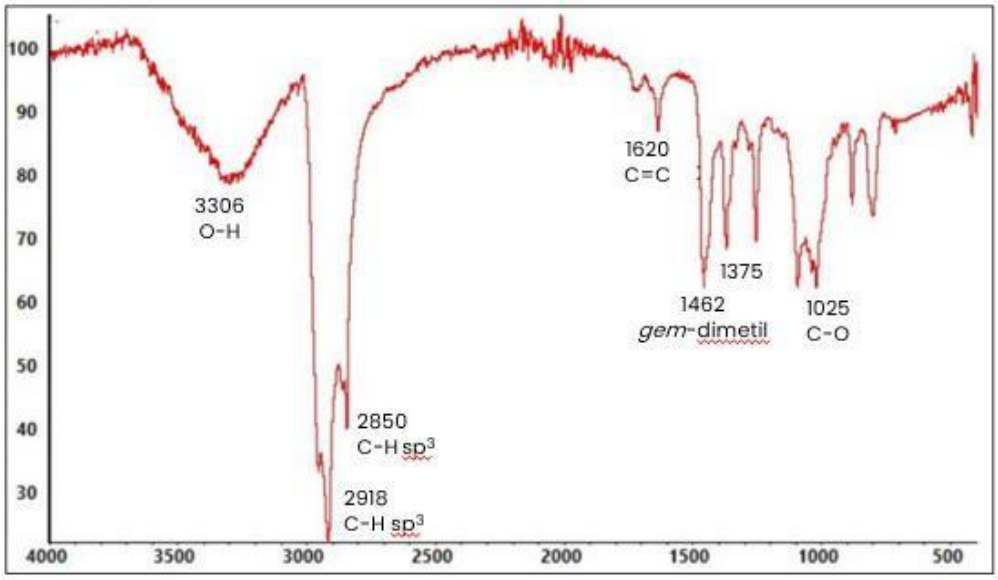
The concentrated ethyl acetate extract of the matoa fruit peel was separated and purified using the column chromatography method to produce triterpenoid. The compound obtained was in the form of colorless crystals. The IR spectrum (Figure 1) of compound **1** showed the absorption bands corresponding to functional groups were observed, including a broad hydroxyl group (3306 cm^{-1}), sp^3 C-H groups (2918 and 2850 cm^{-1}), sp^2 C=C bonds (1620 cm^{-1}), *gem*-dimethyl groups (1462 and 1375 cm^{-1}), and C-O groups (1025 cm^{-1}). The presence of the *gem*-dimethyl stretch is characteristic of triterpenoid compounds.

The HRTOF-MS spectrum analysis (Figure 2) was used to determine the molecular formula. Based on the HRTOF-MS spectrum of compound **1**, it showed a positive ion at *m/z* 441.4051 $[M+H]^+$ with a calculated *m/z* of 441.4096, corresponding to $C_{31}H_{52}O$, suggesting it belongs to the triterpenoid group with a degree of unsaturation of six. This prediction was supported by NMR data. The ^{1}H-NMR spectrum (Figure 3) showed the characteristics of aliphatic compounds where the signal appears in the chemical shift area of 0-2 ppm (Sinaga *et al*. 2022)

The proton signals also revealed characteristic features of triterpenoid compounds. For instance, four tertiary methyl groups were observed at δ_H 0.95 (6H, s, CH_3-18 and CH_3-30), 0.87 (3H, s, CH_3-32), and 0.79 (3H, s, CH_3-31), along with three secondary methyl groups at δ_H 0.87 (3H, d, J = 4.5 Hz, CH_3-21), 1.02 (3H, d, J = 4.5 Hz, CH_3-26), and 1.01 (3H, d, J = 4.5 Hz, CH_3-27). Moreover, in the more shielded region, characteristic signals of cyclopropane protons were observed at δ_H 0.32 (1H, d, J = 4.0 Hz, H-19) and 0.53 (1H, d, J = 4.0 Hz, H-19), presumably originating from a methylene group with identical coupling constants (Yoshida *et al*. 1989). These shifts

Table 1. The result of antibacterial activity of ethanol, *n*-hexane, ethyl acetate, *n*-butanol, aqueous fraction against *S. aureus* and *E. coli*

Sample	MIC (µg/mL)	
	S. aureus	***E. coli***
Ethanol	9.77	78.125
n-hexane	312.5	625
Ethyl acetate	39.063	78.125
n-butanol	156.25	312.5
Aqueous	78.125	156.25
Amoxicilin ($K.^+$)	4.88	7.125



F**igure 1**. IR Spectrum of Compound **1.**

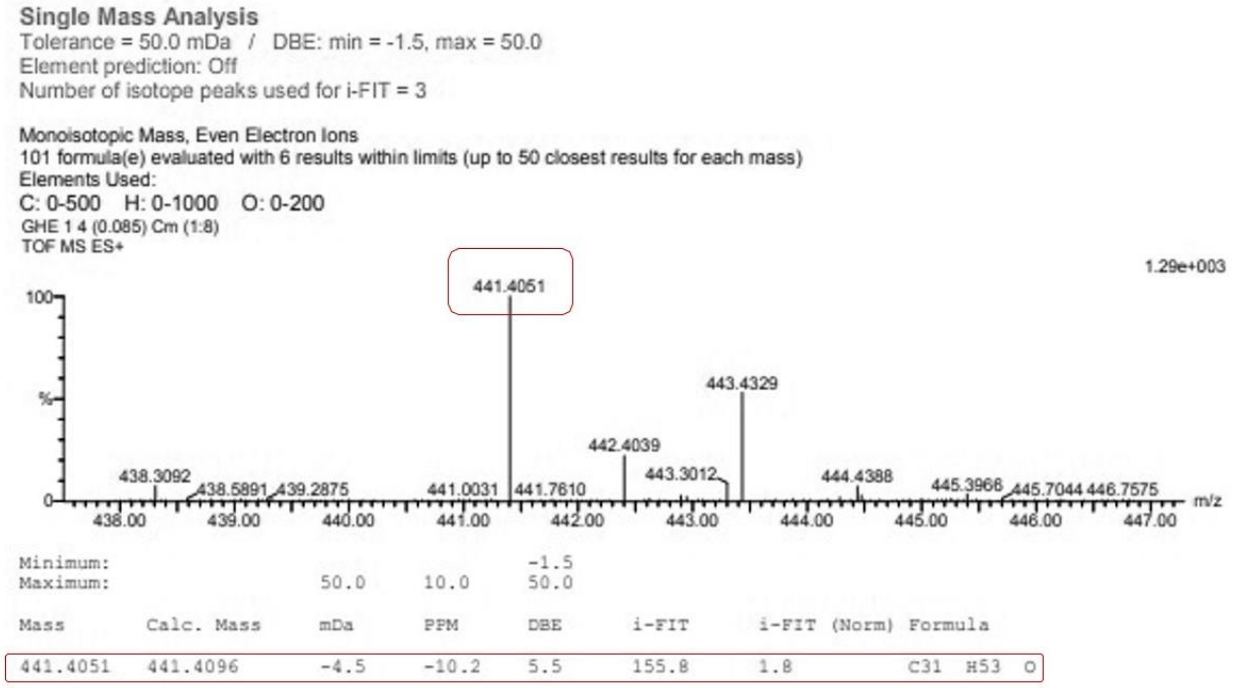


Figure 2. HRTOF-MS Spectrum of Compound **1.**

were typical of cycloartane triterpenoids, thereby fulfilling the structural requirements previously described. Additionally, oxygenated methine signals were observed at δ_H 3.26 (1H, m, H-3), while relatively deshielded signals were noted at δ_H 4.70 (1H, s, H-28) and 4.65 (1H, s, H-28), suggesting terminal olefinic or disubstituted olefinic functionalities. Based on the ^{1}H-NMR spectrum, compound **1** was proposed to be a cycloartane-type triterpenoid with hydroxyl and terminal or disubstituted olefinic groups.

The ^{13}C-NMR and DEPT-135 spectra of compound **1** (Figure 4) indicated the presence of 31 carbon signals, including seven sp^3 methyl carbons, eleven sp^3 methylene carbons, one sp^2 methylene carbon, five sp^3 methine carbons, one oxygenated methine carbon, five sp^3 quaternary carbons, and one sp^2 quaternary carbon. Based on this data, compound **1** was identified as a triterpenoid compound (Matsumoto *et al*. 2019). The presence of two sp^2 carbons was identified, including one sp^2 quaternary carbon (δ_C 157.0) and one sp^2 methylene carbon (δ_C 105.9), suggesting the presence of a double bond, specifically a disubstituted double bond. The degree of unsaturation calculated from HRTOF-MS, FT-IR, ^{1}H-NMR, ^{13}C-NMR, and DEPT-135 data was six, indicating one disubstituted double bond and five

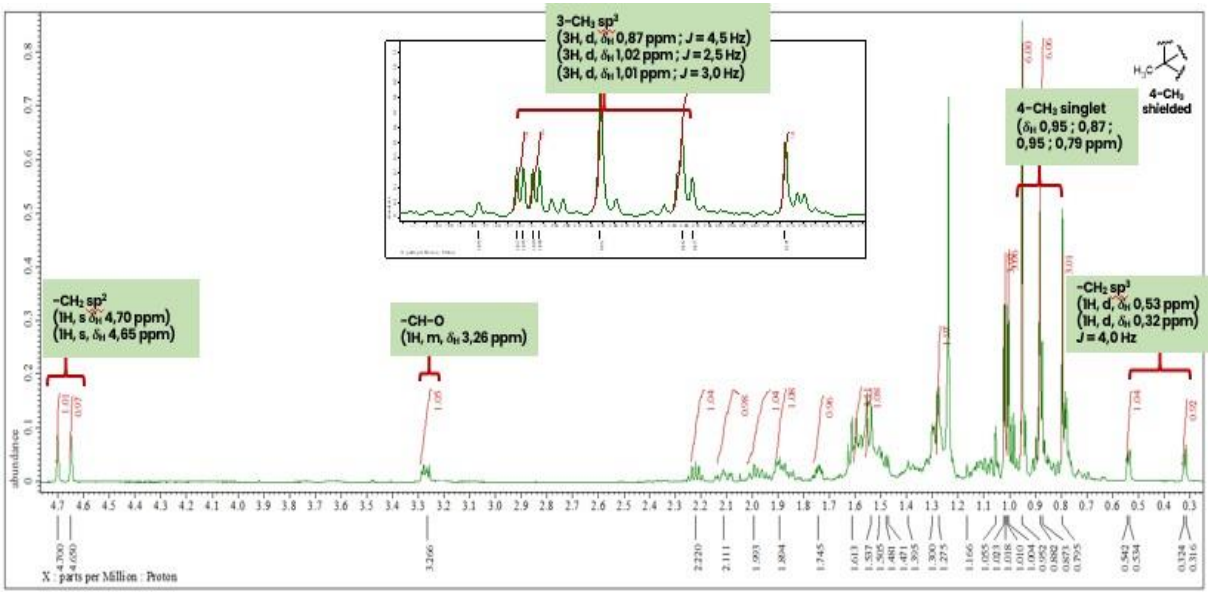


Figure 3. The ^{1}H-NMR spectrum of compound **1** (500 MHz, $CDCl_3$)

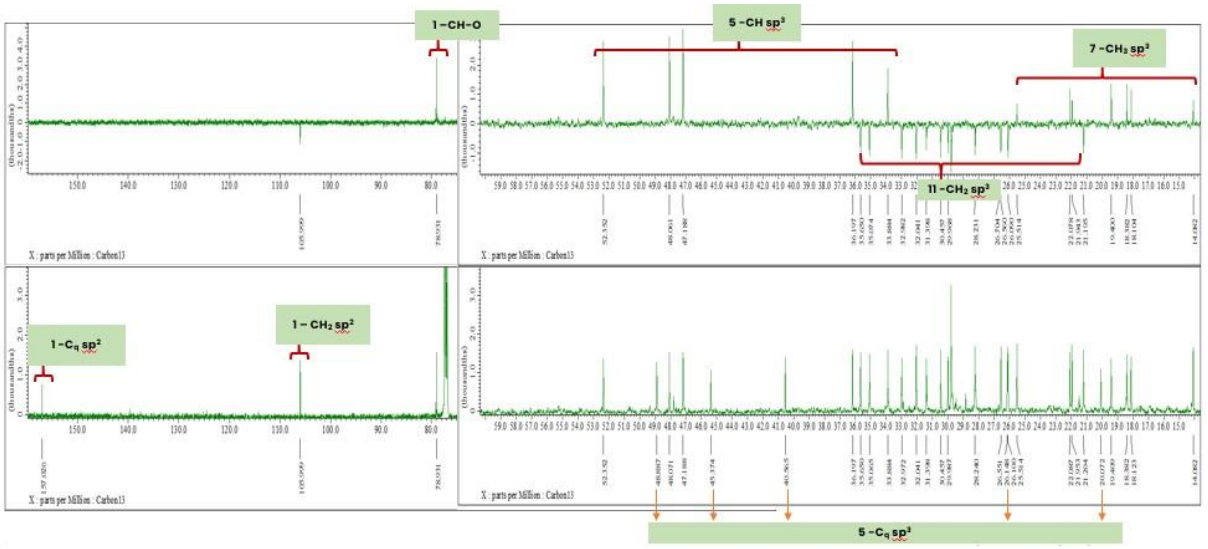


Figure 4. The ^{13}C-NMR and DEPT-135 Spectrum of Compound **1** (125 MHz, $CDCl_3$).

forming a pentacyclic triterpenoid structure. Furthermore, the 13C-NMR confirmed the presence of a cyclopropane ring with relatively shielded quaternary carbon shifts at δ_C 20.0 (C-9) and 26.1 (C-10), as well as characteristic shifts for methylene carbons at δ_C 29.9 (H-19) (Yoshida *et al*. 1989).

Analysis of the HMQC spectrum of compound **1** (Figure 5) revealed correlations between CH_3-18 and C-18, CH_3-30 and C-30, CH_3-31 and C-31, and CH_3-32 and C-32, confirming the presence of four tertiary methyl groups. Additionally, correlations between H-21 and C-21, H-26 and C-26, and H-27 and C-27 confirmed the presence of three secondary methyl groups. The correlations of H-19a (δ_H 0.53) and H-19b (δ_H 0.32) with C-19 (δ_C 29.9) indicated characteristic shifts for a cyclopropane ring, which is a hallmark of cycloartanoid-type triterpenoids (Mayanti *et al*. 2015). Furthermore, correlations between H-3 (δ_H 3.26) and C-3 (δ_C 78.9) confirmed the presence of an oxygenated methine group. There were also correlations observed between H-28 (δ_H 4.65 and 4.70) and C-28 (δ_C 105.9), confirming the presence of a sp^2 methylene group, suggesting a terminal olefinic or disubstituted olefinic functionality.

The HMBC spectrum of compound **1** (Figure 6), several correlations confirmed the presence of a cyclopropane ring formed at C-9, C-10, and C-19. Proton correlations of H-19 at δ_H 0.32 and 0.53 with quaternary carbons at δ_C 20.0 (C-9) and 26.1 (C-10), as well as with methylenes at δ_C 26.5 (C-11) and 32.0 (C-1), confirmed the cyclopropane structure.

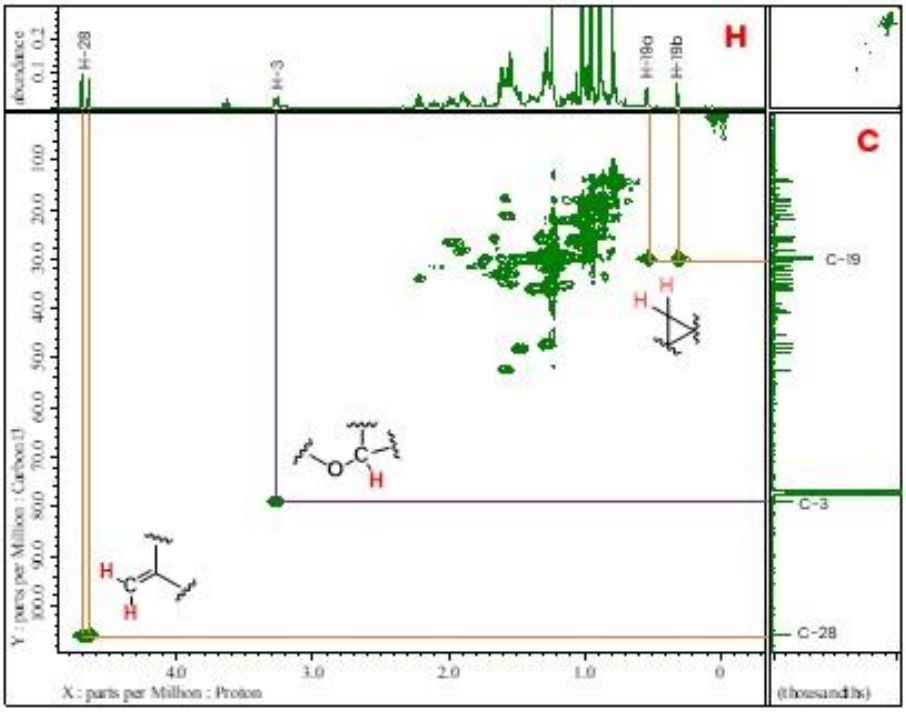


Figure 5. The HMQC spectrum of compound **1.**

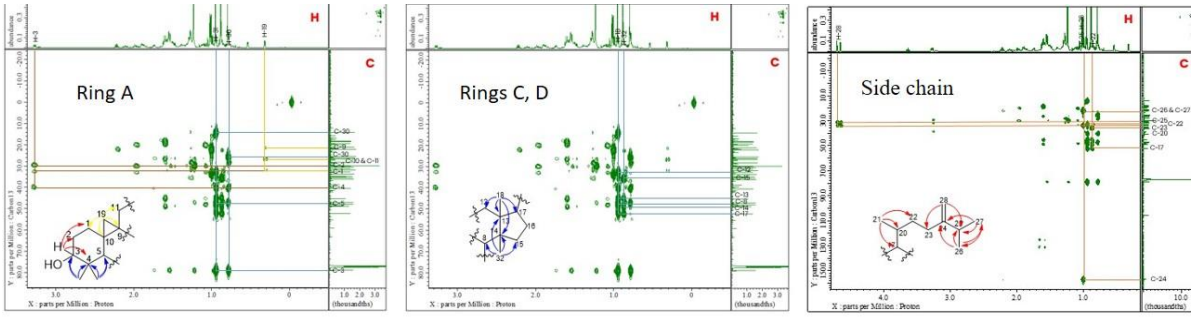


Figure 6. HMBC spectrum correlation of compound **1**.

Additionally, correlations of two methyl groups at δ_H 0.95 (Me-30) and 0.79 (Me-31) with a quaternary carbon at δ_C 40.5 (C-4), and correlations with methines at δ_C 78.9 (C-3) and 47.1 (C-5), indicated *gem*-dimethyl groups attached to C-4. The correlation of the oxygenated methine proton H-3 at δ_H 3.26 with methylenes at δ_C 32.0 (C-1) and 30.4 (C-2), and a quaternary carbon at δ_C 40.5 (C-4), confirmed the hydroxyl group at C-3, completing ring A. Correlations of the methyl proton at δ_H 0.87 (H-31 with methylene at δ_C 35.6 (C-15), quaternary carbons at δ_C 45.3 (C-13) and 48.8 (C-14), and methine at δ_C 48.0 (C-8), indicated positions of CH_3-18 and CH_3-32 attached sequentially to quaternary carbons C-13 and C-14, forming rings C and D. The correlation of the methyl proton at δ_H 0.87 (H-21) with methines at δ_C 36.1 (C-20) and 52.3 (C-17), and with a methylene at δ_C 35.0 (C-22), showed CH_3-21 attached to methine C-20. Furthermore, correlations of methyl protons at δ_H 1.02 (H-26) and 1.01 (H-27) with a methine at δ_C 33.8 (C-25) and a sp^2 quaternary carbon at δ_C 157.0 (C-24), indicated methyl groups CH_3-26 and CH_3-27 attached to methine C-25, causing the relatively deshielded proton H-25 at δ_H 2.22. With one double bond in compound **1**, the pair from C-24 was sp^2 methylene. The sp^2 methylene protons at δ_H 4.70 and 4.65 (H-28) correlated with a methine at δ_C 33.8 (C-25) and a methylene at δ_C 31.3 (C-23), forming the side chain framework of compound **1** from these correlations.

The ^{1}H-^{1}H COSY spectrum of compound **1** (Figure 7) revealed several correlations that ultimately formed the framework of a triterpenoid molecule. Correlations between H-1, H-2, and H-3 formed a distinctive fragment within ring A, and these correlations also pinpointed the position of the hydroxyl group at C-3. Furthermore, correlations between H-5, H-6, H-7, and H-8 delineated the fragment within ring B. Additionally, the correlation between H-11 and H-12 formed ring C, a characteristic feature that supported the proposal of a cycloartane-type triterpenoid, as unlike other

triterpenoids, there was no correlation between H-11 and H-8. Other correlations included H-15, H-16, H-17, H-20, H-22, H-21, and H-23, which formed the framework of ring D and the side chain.

The NOESY spectrum of compound **1** (Figure 8), the correlations were observed between the proton H-5 at δ_H 1.47 and the oxygenated methine proton at δ_H 3.26 (H-3), indicating that the hydroxyl group at C-3 is oriented *β*. Additionally, H-5 showed correlations with protons at δ_H 0.87 (H-31) and 1.61 (H-17), suggesting that Me-31 and H-17 are oriented *α*. Furthermore, H-3 correlated with the proton at δ_H 1.50 (H-1*α*) and 0.79 (H-30), revealing that Me-30 is oriented *α*, causing Me-31 to be oriented *β*. Correlations were also observed between the proton Me-31 and the proton at δ_H 0.53 (H-19), H-19 with the proton at δ_H 1.59 (H-8), H-8 with the proton at δ_H 0.95 (H-18), and H-18 with the proton at δ_H 1.48 (H-20). This indicates that the methylene carbon C-19, H-8, CH_3-18, and H-20 are oriented *β*. Comparison of the 1D-NMR data of compound **1** with literature data for 24-methylenecycloartanol (Yoshida *et al*. 1989), showed similarity (Table 2). Therefore, compound **1** is identified as 24-methylenecycloartanol (Figure 9). This compound has been reported previously as isolated from several species of the Meliaceae family and the genus *Chisocheton*. However, this is the first report of its isolation from the fruit peel of matoa (*Pometia pinnata*), which belongs to the Sapindaceae family and the genus *Pometia*.

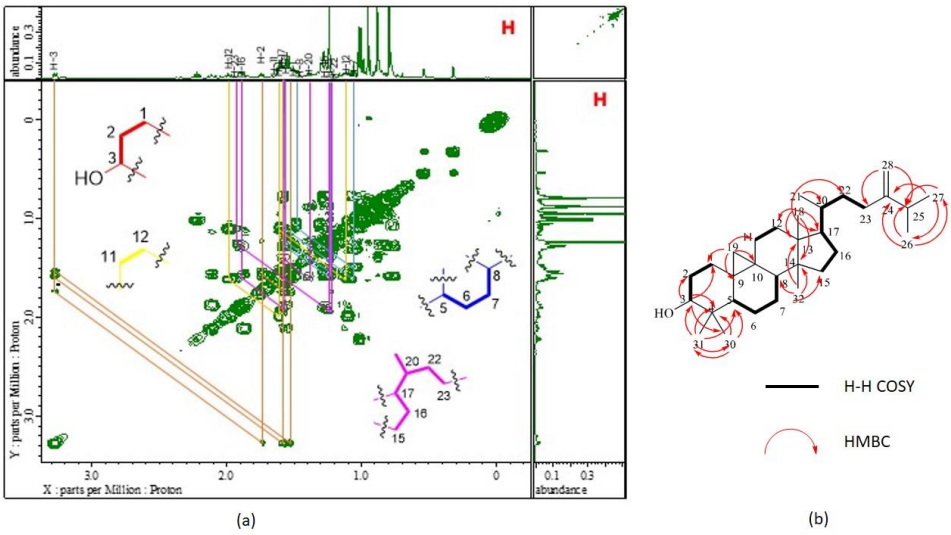


Figure 7. ^{1}H-^{1}H COSY spectrum of compound **1 (a)** and correlation of HMBC and ^{1}H-^{1}H COSY spectrum of compound **1**

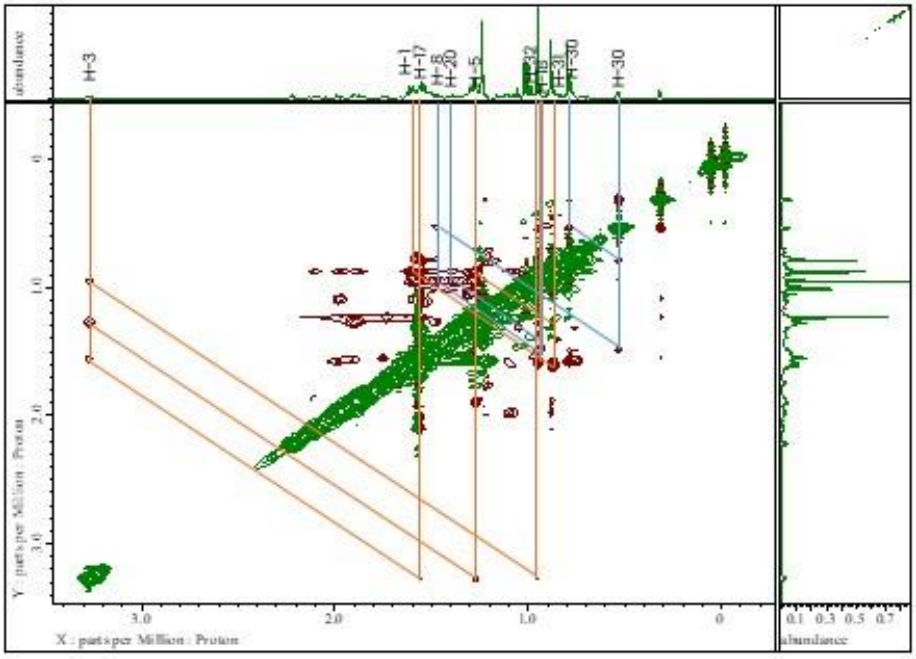


Figure 8. The NOESY spectrum of compound **1**

Table 2. NMR data compound **1** ($CDCl_3$ at 500 MHz for ^1H and 125 MHz for ^{13}C) compared with compound from literature ($CDCl_3$, 400 MHz)

Position Carbon	Compounds			
	1		Literature (Yoshida *et al*. 1989).	
	δ_C (ppm)	δ_H (ppm)	δ_C (ppm)	δ_H (ppm)
1	32.0	1.50 (1H, m) 1.28 (1H, m)	32.5	1.59 (1H, m) 1.26 (1H, m)
2	30.4	1.74 (1H, m) 1.53 (1H, m)	31.2	1.91 (1H, m) 1.83 (1H, m)
3	78.9	3.26 (1H, m)	78.2	3.68 (1H, dd; 12.5; 4.5)
4	40.5	-	41.1	-
5	47.1	1.47 (1H, m)	47.6	1.36 (1H, m)
6	21.2	1.53 (1H, m) 0.85 (1H, m)	21.4	1.62 (1H, m) 0.85 (1H, m)
7	26.1	1.12 (1H, m) 1. 32 (1H, m)	26.3	1.12 (1H, m) 1. 34 (1H, m)
8	48.0	1.59 (1H, m)	48.0	1.60 (1H, dd; 12.5; 6.0)
9	20.0	-	20.2	-
10	26.1	-	26.9	-
11	26.5	1.99 (1H, m) 1.09 (1H, m)	26.9	2.01 (1H, m) 1.20 (1H, m)
12	32.9	1.55 (2H, m)	33.4	1.66 (2H, m)
13	45.3	-	45.8	-
14	48.8	-	49.2	-
15	35.6	1. 30 (2H, m)	35.9	1. 35 (2H, m)
16	28.2	1.96 (1H, m) 1.39 (1H, m)	28.4	1.97 (1H, m) 1.35 (1H, m)
17	52.3	1.61 (1H, m)	52.7	1.69 (1H, m)
18	18.1	0.95 (3H, s)	18.2	1.05 (3H, s)
19	29.9	0.32 (1H, d; 4.0) 0.53 (1H, d; 4.0)	29.9	0.34 (1H, d; 4.5) 0.62 (1H, d; 4.5)
20	36.1	1.48 (1H, m)	36.4	1.49 (1H, m)
21	18.3	0.87 (3H, d;4.5)	18.6	0.98 (3H, d;7.0)
22	35.0	1.27 (1H, m) 1.62 (1H, m)	35.7	1.26 (1H, m) 1.68 (1H, m)
23	31.3	1.89 (1H, m) 2.11 (1H, m)	31.8	2.01 (1H, m) 2.22 (1H, m)
24	157.0	-	156.9	-
25	33.8	2.22 (1H, m)	34.2	2.30 (1H, sep; 7.0)
26	21.9	1.02 (3H, d; 4.5)	22.1	1.07 (3H, d; 7)
27	22.0	1.01 (3H, d; 4.5)	22.0	1.08 (3H, d; 7.0)
28	105.9	4.70 (1H. s) 4.65 (1H. s)	106.7	4.83 (1H. D; 1.0) 4.85 (1H. brs)
29	25.5	0.95 (3H. s)	26.1	1.18 (3H. s)
30	14.0	0.79 (3H. s)	14.6	1.05 (3H. s)
31	19.4	0.87 (3H. s)	19.6	0.96 (3H. s)

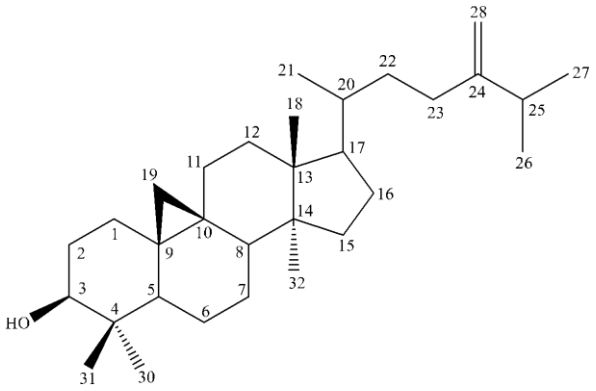


Figure 9. Structure of compound 24-methylenecycloartenol.

The antibacterial activity of compound **1** against *S. aureus* and *E. coli* was investigated, revealing a MIC value of 500 µg/mL. This result categorized the antibacterial efficacy of compound **1** as weak against both bacteria. Its weak activity compared to the strong results observed in previously tested ethyl acetate extracts may be attributed to additional compounds present in the ethyl acetate extract that enhance its effectiveness. Furthermore, factors such as the robustness of *S. aureus* and *E. coli* strains and the purity of the compound also played a role. Previous research has reported that 24-methylenecycloartanol exhibits antibacterial activity against *Streptococcus mutans* and *Streptococcus viridans*, with MIC values of 170 µg/mL and 380 µg/mL, respectively. However, it does not demonstrate antibacterial activity against *S. aureus* (Ajayi *et al*. 2014).

CONCLUSION

Terpenoid 24-methylenecycloartanol (**1**) was isolated from ethyl acetate extracts of matoa fruit peel (*Pometia pinnata*). Compound **1** was reported from the genus *Pometia* for the first time. This compound was evaluated for its antibacterial activity against *Staphylococus aureus and Escherchia coli* showed inactive with MIC value 500 µg/mL.

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