Research Article

Oleanane and Stigmasterol-Type Triterpenoid Derivatives from the Stem Bark of *Albizia gummifera* and Their Antibacterial Activities

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Chromatographic separation of methanol extract of stem bark of *Albizia gummifera* led to the isolation of two oleanane-type triterpenoids (1 and 2), a stigmasterol derivative (3), and stigmasterol (4). The structures of the compounds were elucidated based on 1D and 2D NMR spectroscopic data and comparing with reported literature values. The crude extract and the isolated compounds were evaluated for their antibacterial activities against five bacterial strains. Compounds 1, 2, and 4 showed marginal antibacterial activity with the growth inhibition zone ranging from 6.8 to 13.2 mm against the tested bacterial strains, with compounds 2 and 4 showing significant inhibition (13.0 and 13.2 mm) against *S. flexneri* and *S. typhimurium*, respectively. While, the standard drug, gentamycin showed inhibition zone 20.0 and 24.0 mm against *S. flexneri* and *S. typhimurium*, respectively.

1. Introduction

The genus *Albizia* (family, Fabaceae) comprising of more than 160 species is widely distributed in subtropical and tropical regions with the major diversity in Africa and South America [1, 2]. *Albizia gummifera* C.A. Smith is a species of native to sub-Saharan Africa and Madagascar [3] and commonly known in the indigenous medical system to treat various human ailments [1, 4, 5]. The extracts of different solvents have reported to possess antimicrobial [6], antigonorrheal [7], antiplasmodial, and antileishmanial [8] activities. The plant elaborates triterpenoids [5, 9] as a common metabolite with proapoptotic and antiplasmodial activities. The stem bark of *A. gummifera* has been commonly visited by traditional healers for the treatment of bacterial infection in the eastern part of Ethiopia. However, the phytochemical and biological profile of this plant is not exhaustively studied.

Thus, hereby, we report the isolation of four compounds (1–4) (Figure 1) from the stem bark of *A. gummifera* along with their antibacterial activities.

2. Materials and Methods

2.1. General Experimental Procedures. Solvents and reagents used for extraction and purification of the compounds were of analytical and HPLC grade. Analytical TLC precoated sheets ALUGRAM® Xtra SIL G/UV₂₅₄ (layer: 0.20 mm silica gel 60 with the fluorescent indicator UV_{F254/365}) were used for purity analysis. Silica gel 100–200 mesh was used for column chromatography. Visualization was made on TLC by spraying with 10% H₂SO₄ acid solution and heating on a hot plate. NMR spectra were recorded on an Av600 MHz spectrometer (Bruker, Billerica, MA, USA). Chemical shifts were expressed in parts per million (ppm) downfield of trimethylsilane (TMS) as an internal

FIGURE 1: Structures of the isolated compounds from stem bark of *A. gummifera*.

reference. Whatman filter paper No. 3, 1% dimethylsulfoxide (DMSO), Petri dishes, and gentamycin were used for antibacterial analysis.

2.2. Plant Materials. The stem bark of *A. gummifera* was collected from Wollega University, Nekemte campus, in September 2019. The plant was authenticated by botanist, Dr. Fikadu Gurmessa, and a voucher specimen (TTA004Ag) has been deposited in Wollega University Herbarium.

2.3. Extraction and Isolation. The maceration extraction was employed [10] in this experiment to extract secondary metabolites from the stem bark of *A. gummifera*. About 940 g of sample was extracted with methanol (2 L) three times each. The filtrate was evaporated using a rotary evaporator to yield 10 g of semisolid extract. The crude extract (9 g) was suspended in water and extracted with petroleum ether and chloroform to yield 3 g (yellow semisolid) and 4 g (brown semisolid), respectively. Then, 2.50 g of crude extract of petroleum ether was adsorbed on 3 g of silica gel and subjected to column chromatography. The column was eluted with *n*-hexane (100%) and continued with *n*-hexane/ethyl acetate (95/5, 90/10, 85/15, 80/20, . . . , 25/75, v/v) to obtain 77 fractions, each 200 mL. The fractions were grouped into six subfractions (1–6) based on their TLC profile. Subfraction 2 showed a precipitate and washed repeatedly with petroleum ether to obtain a white powder compound (4) (20 mg). Subfraction 4 was subjected to small column chromatography over silica gel and eluted with *n*-hexane in increasing gradient of ethyl acetate to afford a light yellow powder compound (1) (20 mg).

The chloroform crude (3.50 g) was also subjected to column chromatography over silica gel and eluted with dichloromethane/ethyl acetate (80/20, 70/30, 60/40, and

50/50), each 200 mL. Sixty-four fractions were collected and combined into five (1–5) subfractions. Subfraction 5 was again subjected to small column chromatography over silica gel and eluted with *n*-hexane/ethyl acetate (80/20, 70/30, and 60/40) to afford a white powder compound (3) (21 mg) and light yellow compound (2) (13 mg).

2.4. Pathogenic Bacterial Strains. Five pathogenic bacterial strains, one Gram-positive (*Staphylococcus aureus* (ATCC25923)) and four Gram-negative (*Escherichia coli* (ATCC25922), *Pseudomonas aeruginosa* (ATCC27853), *Salmonella typhimurium* (ATCC13311), and *Shigella flexneri* (ATCC29903)) were obtained from the Department of Biology, Wollega University, and used for evaluation of antibacterial activities.

2.5. Antibacterial Assay of the Isolated Compounds. The paper disc diffusion method was employed to determine the antibacterial activities of the isolated compounds as described by Kumara et al. [11] with slight modification. The pathogens were seeded on Muller–Hinton agar media (model), and simultaneously, sterile circular discs of 6 mm in diameter were prepared from Whatman filter paper No. 3. The solutions of crude extract 20 μ g/mL, each and compounds (1, 2 and 4) (10 μ g/mL, each), were prepared in 1% dimethylsulfoxide (DMSO). The discs were impregnated with these solutions and applied aseptically to the Petri dishes of microbial culture [12]. The applied substances let to diffuse to the agar for half an hour and then incubated at 35°C for 24 h. Both DMSO (1%) and gentamycin (impregnated disc, 10 μ g/mL) were used as negative and positive controls, respectively. All tests were performed in triplicate, and zone of inhibition was measured from the edge of each disc with a ruler.

2.6. Statistical Analysis. Data were measured as mean $\pm$ SD. Statistical analysis was performed using SPSS version 20 Software. The global comparison was done using two-way ANOVA followed by the least significant difference (LSD) multiple comparison test. Pairwise testing was done with the help of the unpaired post hoc test. $P < 0.05$ implies that it is statistically significant.

3. Results and Discussion

Compound **1** was obtained as a light yellow solid. The ^1H NMR spectrum (Table 1) displayed seven singlets at δ_{H} 0.99 (3H, s, H-23), 0.78 (3H, s, H-24), 0.93 (3H, s, H-25), 0.77 (3H, s, H-26), 1.13 (3H, s, H-27), 0.92 (3H, s, H-29), and 1.43 (3H, s, H-30), integrated for three protons each for seven methyl groups; a triplet olefinic protons resonating at δ_{H} 5.27 (1H, t, $J = 3.7$ Hz, H-12), a doublet of doublets methine proton at δ_{H} 3.21 (1H, dd, $J = 11.3, 4.3$ Hz, H-3), and two methine protons signals at δ_{H} 1.56 (1H, m, H-9) and 2.82 (1H, dd, $J = 13.8, 4.7$ Hz, H-18), which are the typical characteristics of an oleanane-type of triterpene [13–15]. Furthermore, di-ortho/meta coupling protons at δ_{H} 7.53 (2H, td, $J = 5.8, 3.5$ Hz, H-4' and H-5') and the deshielded proton signals at δ_{H} 7.71 (2H, dd, $J = 12.5, 5.7, 3.3$ Hz, H-3' and H-6') are a characteristic of ortho-disubstituted benzene moiety [15]. The oxygenated methylene protons at δ_{H} 4.08 (2H, d, $J = 6.7$ Hz, H-1''), multiple proton signals for methine protons at δ_{H} 2.04 (1H, m, H-2''), 1.32 (1H, m, H-6''), two doublet for methyl protons at δ_{H} 0.99 (3H, d, $J = 6.4$ Hz, H-9''), 0.90 (3H, d, $J = 6.0$ Hz, H-10''), and one triplet for methyl protons at δ_{H} 0.92 (3H, t, $J = 3.7$ Hz, H-8'') indicate the presence of geranyl unit (monoterpene) linked through an ester bond.

The ^{13}C NMR spectrum (Table 1) showed carbon signals for 48 carbon atoms, of which 30 carbon atoms are for aglycone core, 8 carbon atoms for phthalate moiety, and 10 carbon atoms for the two isoprene chains. The downfield shifted carbon signals at δ_{C} 167.8 (C-7'), 167.7 (C-8'), 132.5 (C-2'), 132.4 (C-1'), 130.9 (C-4' and C-5'), and 128.9 (C-3' and C-6') are carbons for phthalate moiety, while the signals resonate at δ_{C} 71.8 (C-1'') and 27.7 (C-2'' and C-3''), three methyl carbons resonate at 11.0 (C-8''), 19.2 (C-9''), and 14.1 (C-10'') for the geranyl unit (monoterpene), whereas the signals of seven methyls of aglycone core (C-23, C-24, C-25, C-26, C-27, C-29, and C-30) are resonated at δ_{C} 28.1, 15.5, 15.3, 17.1, 25.9, 33.1, and 23.7, respectively. The signals resonating at δ_{C} 38.4 (C-1), 79.0 (C-3), 122.6 (C-12), 143.6 (C-13), 40.9 (C-18), and 183.7 (C-28) are in accordance with the reported literature data for oleanolate [13–16] except signal at δ_{C} 68.2 (C-22) which could be due to the oxygen attachment with the phthalate moiety. The gross structure of the aglycone and position of the substituent was determined by analysis of ^1H - ^1H COSY and HMBC experiments (Figure 2). The ^1H - ^1H COSY cross-peaks showed the coupling of hydroxymethine proton H-3 (δ_{H} 3.21) with H-2 (δ_{H} 1.64), H-12 (δ_{H} 5.27) with H-11 (δ_{H} 1.90), H-15 (δ_{H} 1.32) with H-16 (δ_{H} 0.94), H-18 (δ_{H} 2.82) with H-19 (δ_{H} 1.61), and H-21 (δ_{H} 1.71) with H-22 (δ_{H} 4.22) enabled to construct the structure of aglycone. The correlation of proton H-3' (δ_{H}

7.71) with H-4' and H-5' (δ_{H} 7.53) through ortho/meta coupling further confirm the phthalate moiety. Similarly, the cross-peaks from oxymethylene proton H-1'' (δ_{H} 4.08) with H-2'' (δ_{H} 2.04) and H-5'' (δ_{H} 1.78) with H-6'' (δ_{H} 1.32) also revealed the geranyl unit (monoterpene).

The long-range HMBC coupling (Figure 2) from oxymethine proton at δ_{H} 4.22 (H-22) to carbon signal at δ_{C} 23.6 (C-16), δ_{C} 38.7 (C-21), δ_{C} 30.7 (C-20), and δ_{C} 167.8 (C-7') enabled to establish the phthalate moiety at C-22 through an ester bond. The oxymethylene protons peaks at δ_{H} 4.08 (H-1'') showed an HMBC correlation to carbon signals at δ_{C} 167.7 (C-8') and δ_{C} 27.7 (C-2'') confirmed the attachment of geranyl unit at C-8' of phthalate. Thus, based on the above spectroscopic analysis, the structure of compound **1** was deduced to be a 3-hydroxy-22-(2-((2, 6-dimethyloctyloxy) carbonyl) benzoyloxy)olean-12-en-28-oic acid.

Compound **2** was obtained as a yellow powder. The NMR spectral data showed similar spectral feature with compound **1** except for some substituted positions. The ^1H NMR spectrum (Table 1) displayed five aromatic protons at δ_{H} 7.70 (1H, dd, $J = 5.7, 3.3$ Hz, H-2' and H-6') and δ_{H} 7.53 (1H, dd, $J = 5.7, 3.3$ Hz, H-3', H-4', and H-5'), containing HSQC correlations with carbons at δ_{C} 128.8 (C-2' and C-6') and 130.9 (C-3', C-4', and C-5'), respectively. However, the ^{13}C NMR spectrum (Table 1) showed an esteric carbonyl carbon at δ_{C} 167.8 (C-7') and one quaternary carbon at δ_{C} 132.5 (C-1'), indicating the benzoate linked to oleanolic moiety. The long-range HMBC correlations (Figure 2) between oxymethine protons at δ_{H} 4.22 (H-22) and carbon signals at δ_{C} 38.7 (C-21), δ_{C} 30.7 (C-20), and δ_{C} 23.6 (C-16) and carbonyl carbon at δ_{C} 167.8 (C-7') established the linkage of benzoate at C-22. Therefore, based on the above findings, the structure of compound **2** was defined to be 22-(benzoyloxy)-3-hydroxyolean-12-en-28-oic acid.

Compound **3** was obtained as a white solid. The ^1H and ^{13}C NMR spectra data are similar to that of stigmasterol (**4**) (coisolated from the same fraction) except for some signals for C-28, C-29, and C-3 of the stigmasterol (could be due to the substitution effect). The ^1H NMR spectrum displayed doublet of doublets oxymethylene protons at δ_{H} 4.22 (2H, dd, $J = 11.4, 5.9$ Hz, H-29). These protons showed a long-range HMBC cross-coupling (Figure 3) with carbonyl ester of benzoate moiety, whose presence is evidenced from strongly deshielded doublet of doublets at δ_{H} 7.70 (2H, dd, $J = 5.7, 3.3$ Hz) for H-2'' and H-6'' and multiplet at δ_{H} 7.53 (3H, for H-3'', H-4'', and H-5''), indicating that the position of the benzoate substituent at C-29.

The ^1H NMR spectrum also showed signals for aliphatic carboxylate (Table 1). In this regard, ^{13}C NMR spectrum showed that a downfield shifted carbon signal at δ_{C} 178.5 is assignable to carbonyl carbon (C-1') and the signal at δ_{C} 33.8 for C-2'. The HSQC spectrum confirmed the connectivity between protons at δ_{H} 2.35 (2H, t, $J = 7.5$ Hz), 1.65 (2H, dt, $J = 34.2, 7.1$ Hz), 1.33 (2H, m), and 0.91 (3H, t, $J = 6.8$ Hz) with carbon atoms at δ_{C} 33.8 (C-2'), 24.7 (C-3'), 23.0 (C-17'), and 14.1 (C-18'), respectively.

The triplet methylene protons at δ_{H} 2.35 (2H, t, $J = 7.6$ Hz) showed strong HMBC correlations with carbon at δ_{C} 178.5 (carbonyl carbon, C-1') and δ_{C} 24.7 (C-3'),

TABLE 1: ^1H NMR and ^{13}C NMR (600 MHz) spectroscopic data for compounds **1–4** in CDCl_3 .

C/H	1		2		3		4	
	δ_{H} (m, J in Hz)	δ_{C} (ppm)	δ_{H} (m, J in Hz)	δ_{C} (ppm)	δ_{H} (m, J in Hz)	δ_{C} (ppm)	δ_{H} (m, J in Hz)	δ_{C} (ppm)
1	1.62 (m)	38.4	1.62 (m)	38.4	1.14 (m)	37.3	1.14 (m)	37.3
2	1.64 (m)	27.2	1.64 (m)	27.2	1.55 (m)	31.6	1.55 (m)	31.7
3	3.21 (dd, 11.3, 4.3)	79.0	3.22 (dd, 11.3, 4.3)	79.0	3.52 (td, 11.2, 5.7)	71.8	3.52 (td, 11.2, 5.7)	71.8
4	—	38.8	—	39.3	2.30 (d, 5.0)	42.2	2.30 (d, 5.0)	42.2
5	0.74 (m)	55.2	0.75 (m)	55.2	—	140.7	—	140.8
6	1.57 (m)	18.3	1.56 (m)	18.3	5.35 (dd, 5.4, 1.9)	121.7	5.35 (dd, 5.4, 1.9)	121.7
7	1.45 (m)	32.6	1.36 (m)	32.6	1.83 (m)	31.9	1.83 (m)	31.9
8	—	39.3	—	37.1	1.45 (m)	31.9	1.45 (m)	31.9
9	1.56 (m)	47.6	1.56 (m)	47.6	0.93 (m)	50.2	0.93 (m)	50.2
10	—	37.1	—	38.8	—	36.5	—	36.5
11	1.90 (m)	23.4	1.90 (m)	23.4	1.30 (m)	22.7	1.30 (m)	21.1
12	5.27 (t, 3.7)	122.6	5.28 (t, 3.7)	122.6	1.83 (m)	39.7	1.83 (m)	39.7
13	—	143.6	—	143.6	—	42.3	—	42.3
14	—	41.6	—	41.6	1.00 (m)	56.9	1.00 (m)	56.9
15	1.32 (m)	28.9	1.08 (m)	27.7	1.55 (m)	24.4	1.55 (m)	24.4
16	0.94 (m)	23.6	1.42 (m)	23.6	1.33 (m)	28.9	1.33 (m)	28.9
17	—	46.5	—	46.5	1.15 (m)	56.0	1.15 (m)	56.0
18	2.82 (dd, 13.8, 4.7)	40.9	2.82 (dd, 13.8, 4.7)	41.0	0.68 (s)	12.1	0.68 (s)	12.0
19	1.62 (m)	45.9	1.15; 1.64 (m)	45.9	1.03 (s)	19.8	1.03 (s)	19.8
20	—	30.7	—	30.7	2.04 (m)	40.5	2.04 (m)	40.5
21	1.70 (m)	38.7	1.70 (m)	38.7	1.04 (m)	21.1	1.04 (m)	21.2
22	4.22 (dd, 11.5, 5.9)	68.2	4.22 (dd, 11.4, 5.9)	68.2	5.15 (m)	138.3	5.15 (m)	138.3
23	0.99 (s)	28.1	1.00 (s)	28.1	5.03 (dd, 15.1, 8.8)	129.3	5.03 (dd, 15.1, 8.8)	129.3
24	0.78 (s)	15.5	0.76 (s)	15.5	1.55 (m)	51.3	1.55 (m)	51.2
25	0.93 (s)	15.3	0.93 (s)	15.3	1.45 (m)	31.9	—	45.8
26	0.77 (s)	17.1	0.75 (s)	17.1	0.94 (m)	11.0	0.82 (d, 6.6)	21.1
27	1.13 (s)	25.9	1.16 (s)	25.9	1.42 (m)	23.7	0.80 (d, 6.6)	19.0
28	—	183.7	—	183.5	1.70 (m)	38.7	0.71 (s)	25.4
29	0.92 (s)	33.1	0.94 (s)	33.1	4.22 (dd, 11.4, 5.9)	68.2	1.03 (s)	12.3
30	1.43 (s)	23.7	1.43 (s)	23.8	—	—	—	—
1'	—	132.4	—	132.5	—	132.5	—	—
2'	—	132.5	7.70 (dd, 5.7, 3.3)	128.8	7.70 (dd, 5.7, 3.3)	128.8	—	—
3'	7.71 (dd, 12.5, 5.7, 3.3)	128.8	7.53 (dd, 5.7, 3.3)	130.9	7.53 (dd, 5.7, 3.3)	130.9	—	—
4'	7.53 (dt, 5.8, 3.5)	130.9	7.53 (dd, 5.7, 3.3)	130.9	7.53 (dd, 5.7, 3.3)	130.9	—	—
5'	7.53 (dt, 5.8, 3.5)	130.9	7.53 (dd, 5.7, 3.3)	130.9	7.53 (dd, 5.7, 3.3)	130.9	—	—
6'	7.71 (dd, 12.5, 5.7, 3.3)	128.9	7.70 (dd, 5.7, 3.3)	128.8	7.70 (dd, 5.7, 3.3)	128.8	—	—
7'	—	167.8	—	167.8	—	167.8	—	—
8'	—	167.7	—	—	—	178.5	—	—
9'	4.08 (d, 6.7)	71.8	—	—	2.35 (t, 7.5)	33.8	—	—
10'	2.04 (m)	27.7	—	—	1.65 (dt, 34.2, 7.1)	24.7	—	—
11'	1.01 (m)	27.7	—	—	1.86 (m)	31.9	—	—
12'	1.62 (m)	22.9	—	—	1.55 (m)	31.9	—	—
13'	1.78 (m)	32.4	—	—	1.30–1.45 (m)	29.7	—	—
14'	1.32 (m)	33.8	—	—	1.30–1.45 (m)	29.5	—	—
15'	1.50 (m)	30.4	—	—	1.30–1.45 (m)	29.3	—	—
16'	0.94 (t, 3.7)	11.0	—	—	1.30–1.45 (m)	29.5	—	—
17'	0.99 (d, 6.4)	19.2	—	—	1.30–1.45 (m)	29.6	—	—
18'	0.90 (d, 6.0)	14.1	—	—	1.30–1.45 (m)	29.4	—	—
19'	—	—	—	—	1.30–1.45 (m)	29.7	—	—
20'	—	—	—	—	1.30–1.45 (m)	29.7	—	—
21'	—	—	—	—	1.30–1.45 (m)	29.7	—	—
22'	—	—	—	—	1.30–1.45 (m)	29.7	—	—
23'	—	—	—	—	1.27 (m)	30.4	—	—
24'	—	—	—	—	1.33 (m)	23.0	—	—
25'	—	—	—	—	0.91 (t, 7.5)	14.1	—	—

respectively. Based on the above spectral data, the structure of compound **3** was defined as 29-benzoyl-3-octadecanoyl stigmaterol.

Compound **4** was isolated as a white powder. The ^1H NMR spectrum (Table 1) displayed three doublet of doublets peaks at δ_{H} 5.35 (1H, dd, $J = 5.2, 2.2$ Hz), 5.15 (1H, dd, $J = 15.1$,

FIGURE 2: Key HMBC (curved arrow) and ¹H-¹H COSY (bold line) correlations of compounds 1 and 2.

FIGURE 3: Key HMBC (curved arrow) and ¹H-¹H COSY (bold line) correlations of compound 3.

TABLE 2: Bacterial growth inhibition zone in diameter (mm) of crude extracts (20 µg/mL each) and isolated compounds (1, 2, and 4) (10 µg/mL each).

Compounds/extracts	Tested micro-organism				
	<i>S. aureus</i>	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. typhimurium</i>	<i>S. flexneri</i>
ME	9	8	7	10	10
PE	8	9	7	11	7
CHE	—	7	11	7	14*
1	7	7	7.2	—	—
2	—	7.3	10	6.8	13
4	7.4	7	7.3	13.2	6.9
Gentamycin	16	21	14	20	24

—, not active; ME, methanol extract; PE, petroleum ether extract; CHE, chloroform extract. All values are mean values ± standard deviation of three replicates.

8.7 Hz), and 5.01(1H, dd, $J = 15.2, 8.7$ Hz), which are typical signals for olefinic proton (H-6) of the steroidal skeleton and olefinic protons (H-22 and H-23), respectively. The proton signal at δ_H 3.52(1H, dd, $J = 11.2, 6.5, 4.7$ Hz) integrating for 1H was indicative of hydroxymethine proton of H-3. Two singlet peaks at δ_H 0.86 (3H, s) and 1.05(3H, s) were assigned to two tertiary methyl groups attached to C-13 (H-18) and C-10 (H-19), respectively. The spectrum further revealed three doublet peaks at δ_H 1.01 (3H), 0.86 (3H), and 0.93 (3H) which are assigned to methyl groups at C-20 (H-21) and C-25 (H-26 and H-27), respectively.

The ¹³C NMR spectrum (Table 1) also showed the presence of 29 carbon atoms, of which the signal at δ_C 71.8 is assignable to C-3. The signals at δ_C 140.8, 121.7, 138.3, and 129.3 are corresponding to olefinic carbons at C-5, C-6,

C-22, and C-23, respectively. Based on these data and comparison to the reported literature [17–19], compound 4 was found to be stigmaterol. This is the first report of compound 4 from *A. gummifera*.

Compounds 1, 2, and 4 were evaluated for their anti-bacterial activities against five pathogenic bacteria strains: *Staphylococcus aureus* (ATCC25923), *Escherichia coli* (ATCC25922), *Pseudomonas aeruginosa* (ATCC27853), *Salmonella typhimurium* (ATCC13311), and *Shigella flexneri* (ATCC29903) (Table 2) using the disk diffusion method.

The crude extracts showed weak to moderate activity on both Gram-positive and Gram-negative bacterial strains with zone of inhibition ranging 7–14 mm with chloroform extract demonstrating the highest zone of growth inhibition (14 mm) ($P < 0.05$) against *S. flexneri*. This is in agreement

with the report that the hydroalcoholic extract of *A. gummifera* exhibited growth inhibition against bacterial pathogens [6, 20]. The isolated compounds also showed moderate antibacterial activity against the test strains. These activities vary from strain to strain. Compound **4** showed significant inhibition (13.2 mm) against *S. typhimurium* (ATCC13311). Gram-negative bacteria showed greater susceptibility to **2** and **4** than Gram-positive. It might be due to the thickness of the peptidoglycan layer. It is worth to highlight that stigmaterol has been reported to inhibit several proinflammatory and matrix degradation mediators typically involved in human osteoarthritis- (OA-) induced cartilage degradation, at least in part through the inhibition of the NF- κ B pathway [21]. It also showed good membrane stabilizing activity in HRBC with minimum stabilization 62.74% at 10 μ g/mL and maximum stabilization 65.19% at 40 μ g/mL [22].

The antibacterial activity results confirm the traditional value of the plant (*A. gummifera*), provided that these results further supported with in vivo and cytotoxicity tests.

4. Conclusion

Four triterpenoids **1**, **2**, **3**, and **4** were isolated from stem bark of *A. gummifera*. This is the first report of compounds **1**, **2**, and **3**. The crude extract and isolated compounds showed moderate antibacterial activity with compound **4** exhibiting the highest. The observed antibacterial activities of the extracts and pure compounds could give insight about potential of the traditionally used medicinal plants for development of antibacterial drugs.

Data Availability

NMR data of compounds 1–4 are included in the Supplementary Materials.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Supplementary Materials

NMR data of compounds 1–4 are provided in the supplementary information. (*Supplementary Materials*)

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