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Research Article

New Bioactive Oleanane Type Compounds from *Coriandrum sativum* Linn.

Muhammad Iqbal,[1] Muhammad Bilal,[2] Rubina Iqbal,[1] Muhammad Akram,[3] Imam Bakhsh Baloch,[1] and Musa Kaleem Baloch[1]

[1] *Department of Chemistry, Gomal University, Dera Ismail Khan 29050, Pakistan*
[2] *Gomal College of Veterinary Sciences, Gomal University, Dera Ismail Khan 29050, Pakistan*
[3] *Medicinal Botanic Centre, PCSIR Laboratories Complex Peshawar, Khyber Pakhtunkhwa 25120, Pakistan*

Correspondence should be addressed to Muhammad Iqbal; miqbal_44@yahoo.com

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Five (**1–5**) new bioactive oleanane type triterpenoids have been isolated from ethyl acetate soluble fraction of ethanolic extract of *Coriandrum sativum* Linn. of Umbelliferae family. Ethanolic extract of the whole plant was fractionated in organic solvents. Ethyl acetate fraction was subjected to column chromatography on HPLC RP-18 to get 1-oxo-11β,21β-dihydroxy-oleanane (**1**), 1-oxo-11β-hydroxy-21β-*O*-acetyloleanane (**2**), 1-oxo-11β-hydroxy-21β-*O*-angeloyloleanane (**3**), 1-oxo-11β-*O*-angeloyl-21β-*O*-acetyloleanane (**4**), and 1-oxo-11β,21β-*O*-dibenzoyloleanane (**5**). The structures were elucidated after analysis of spectroscopic data, UV, IR, NMR (^{1}H, ^{13}C, 1D, and 2D), and mass measurements. Suspension in water of crude ethyl acetate extract was employed to treat sheep with ringworm disease. All isolated compounds (**1–5**) displayed excellent activity in terms of inhibition zones, MICs, MBCs, and MFCs against both bacteria and fungi. Ethyl acetate extract showed excellent antiringworm activity in sheep.

1. Introduction

Coriandrum sativum Linn. of family Umbelliferae is an annual herbaceous plant and is cultivated all over the world for its use not only in the indigenous medicines but also as one of the ingredients of all spicy foods especially of Pakistan and India. The plant is a rich source of essential oil and many of the researchers have almost concentrated on extraction, composition, biological activities, and use against various diseases of its crude extracts and essential oils. *C. sativum* is an important medicinal plant used against a number of diseases. Nair et al. have indicated the antiarthritic activity of hydroalcoholic extract of *C. sativum* [1]. Aqueous extract of *C. sativum* seed has anxiolytic effect [2]. Ethanolic extract of the species has been reported to display anti-inflammatory and analgesic activity [3]. Its ethanolic extract possesses antitumor activity [4, 5]. Extracts of *C. sativum* show diuretic and cholesterol lowering activity [6]. The extract of the plant has been used against diabetes mellitus [7]. Essential oil from seeds of *C. sativum* has been used as antioxidant and antifungal agent [8]. Essential oil of the species has been used as wound healing medicine [9]. Naik et al. reported isolation of two pentacyclic oleanane type triterpenoids, coriandinonediol and its acetyl derivative, from the seeds of the species [10]. Dharmalingam and Nazni have shown the presence of alkaloids, steroids, saponins, tannins, and glycosides in the flowers of *C. sativum* Linn. [11].

Up till now, all of the activities of *C. sativum* Linn. such as radical scavengers, antioxidants, anti-inflammatory, antianxiety, antibacterial, and antifungal have been associated with its essential oils and glycolipids [12–18]. Many other species of the Umbelliferae are rich in terpenes and terpenoids [19]; however, no proper attention has been paid to *Coriandrum sativum* Linn. for isolation of new compounds. These aspects prompted us to explore the locally cultivated species of *C. sativum* Linn. for phytochemical constituents. In the present work, whole plant of *C. sativum* Linn. was investigated for phytochemicals and resulted in the isolation of five (**1–5**) new oleanane type triterpenoids.

2. Material and Methods

2.1. Plant Material. C. sativum Linn. was grown in the botanical garden, Rakh Bibi Campus, Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. The plants were identified by Professor Hamidullah Khan, Head of Pharmacognosy Department, Faculty of Pharmacy, Gomal University, Dera Ismail Khan. A specimen number CS 25 was retained in the herbarium. The seeds, the leaves, and whole parts of the plant were collected at appropriate time and investigated for their essential oil, bioactive constituents, and bioactivity.

2.2. Extraction. The whole dried plant material (roots, stems, leaves, and seeds) of *C. sativum* Linn. was powdered using grinding machine. The grinded material (5000 g) was extracted with MeOH (7.5 L × 3) at room temperature. Methanolic solution was filtered using Whatman number 1 filter paper and concentrated at reduced temperature and pressure to get dark brown extract 500 g.

2.3. Isolation of Compounds. The methanol extract (480 g) was suspended in water (1000 mL) and reextracted with n-hexane (3 × 300 mL) chloroform (3 × 250 mL), ethyl acetate (3 × 250 mL), and n-butanol (3 × 50 mL). Each fraction was dried over anhydrous sodium sulphate and evaporated to dryness to yield n-hexane fraction (122.4 g, 25.5%), chloroform fraction (134.3 g, 27.98%), ethyl acetate fraction (124.3 g, 25.89%), n-butanol fraction (72.3 g, 15.06%), and aqueous fraction (25.4 g, 5.29%).

The ethyl acetate soluble fraction (20 g) was subjected to chromatography on silica gel column (192 × 5.4 cm). It was eluted with petroleum ether/ethyl acetate mixture (6/4, 25000 mL) with flow rate of 2 mL/min to yield twenty (1–20) fractions each 250 mL. Fractions 3–5, containing identical constituents (on TLC similarities), were combined, evaporated to dryness in vacuo to afford a crude mixture (1.4 g), and subsequently purified by semipreparative HPLC using 15% water: acetonitrile as eluent, yielding **1** (7 mg) and an inseparable mixture of **2** and **3** (11 mg). Fractions 11–13 after combination (1.2 g) were subjected to rechromatography on the same column of silica gel. The column was eluted using increasing concentrations of ethyl acetate in petroleum ether to end up with nine (1.1–1.9) pooled fractions.

Fractions 1.4 and 1.5, based on TLC behavior, were combined together (1.3 g) and chromatographed over a silica gel column. The column was eluted using chloroform, 5% methanol in chloroform, and 10% methanol in chloroform, successively. The 5% methanol in chloroform elution resulted in three (1.4.1–1.4.3) fractions. Repeated column chromatography of these fractions resulted in the isolation of compounds **4** (23 mg) and **5** (15 mg). Fractions 6–8 (1.7 g) were combined and chromatographed over silica gel column using chloroform as eluent and the polarity was increased by methanol. Ten (6.1–6.10) fractions were collected. Fraction 6.1.4–6.1.7 (350 mg) was applied to a reversed-phase preparative HPLC on a LiChrosorb RP-18 column (7 μm, 2 × 30 cm i.d, Merck) and eluted with MeOH-H_2O (80/20) at the rate of 10 mL/min (t_R = 7.5 min) to afford pure compounds (**1**) (31.3 mg), (t_R = 7.9 min) (**2**), (t_R = 8.1 min) (25.3 mg), (t_R = 8.4 min) (**3**) (31.3 mg), (t_R = 8.7 min) (**4**) (15.3 mg), and (t_R = 9.3 min) (**5**) (37.3 mg), respectively.

*Compound **1***. White solid needles, crystals, m.p. 255–258°C; $[\alpha]_D^{25}$ + 5.43 (*c* 1.4, $CHCl_3$); UV (MeOH) λ_{max} (log ε) 216 (1.56) nm; IR (dry) ν_{max} 3532, 3404, 2940, 2870, 1620, 1450, 1250, 760 cm^{-1}; ^{1}H-NMR (C_5D_5N, 300 MHz) δ: 2.22 (2H, ddd, *J* = 13, 5.2, 3.5 Hz, H-2), 1.97 (2H, dd, *J* = 13, 5.2 Hz, H-3), 1.83 (1H, d, *J* = 11.5 Hz, H-5), 2.17 (2H, dd, *J* = 14, 6.5 Hz, H-6), 2.89 (1H, ddd, *J* = 16.5, 12.5, 6.5 Hz, H-7α), 2.74 (1H, dd, *J* = 16.5, 5.0 Hz, H-7β), 1.64 (1H, dd, *J* = 14, 6.5 Hz, H-9), 3.29 (1H, ddd, *J* = 14, 6.5, 4.2 Hz, H-11), 1.88 (2H, ddd, *J* = 14.1, 4.5, 12.2 Hz, H-12), 2.01 (1H, dd, *J* = 12.2, 4.5 Hz, H-13), 2.44 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-15α), 1.46 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15β), 2.53 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 1.56 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16β), 1.78 (1H, ddd *J* = 12.5, 12.5, 3.5 Hz, H-18), 1.71 (1H, ddd, *J* = 14.5, 11.5, 4.0 Hz, H-19α), 1.17 (1H, dd, *J* = 14.5, 4.0 Hz, H-19β), 3.46 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-21), 2.91 (1H, ddd, *J* = 13.5, 13.5, 2.5 Hz, H-22α), 1.91 (1H, dd, *J* = 13.5, 13.5 Hz, H-22β), 1.66 (3H, s, H-23), 1.07 (3H, s, H-24), 1.13 (3H, s, H-25), 1.16 (3H, s, H-26), 1.55 (3H, s, H-27), 1.17 (3H, s, H-28), 1.38 (3H, s, H-29), 0.97 (3H, s, H-30); ^{13}C-NMR (C_5D_5N, 75 MHz) δ: 214.7 (C-1), 68.2 (C-2), 47.9 (C-3), 45.7 (C-4), 56.7 (C-5), 19.5 (C-6), 35.5 (C-7), 40.4 (C-8), 50.6 (C-9), 38.8 (C-10), 71.4 (C-11), 43.7 (C-12), 51.3 (C-13), 42.1 (C-14), 29.1 (C-15), 27.9 (C-16), 46.5 (C-17), 44.6 (C-18), 27.1 (C-19), 35.7 (C-20), 72.8 (C-21), 42.9 (C-22), 24.1 (C-23), 23.5 (C-24), 17.5 (C-25), 17.4 (C-26), 24.9 (C-27), 25.1 (C-28), 28.8 (C-29), 24.6 (C-30). EI-MS: *m/z* = 458 (M^+, 3, $C_{30}H_{50}O_3$), 440 (12, M^+-H_2O), 430 (27, M^+-CO), 422 (15, M^+-$2H_2O$), 291 (10, $C_{19}H_{31}O_2^+$), 263 (11, $C_{18}H_{31}O^+$), 249 (23, $C_{16}H_{25}O_2^+$), 207 (31, $C_{14}H_{23}O^+$), 189 (43, $C_{14}H_{21}^+$), 135 (42, $C_9H_{11}O^+$), 109 (34, $C_7H_9O^+$), 95 (44, $C_7H_{11}^+$); HR-EI-MS: *m/z* = 458.7162, calcd. for $C_{30}H_{50}O_3$; 458.7158 observed.

*Compound **2***. White solid, crystals, m.p. 291–293°C; $[\alpha]_D^{25}$ + 4.43 (*c* 1.4, $CHCl_3$); UV (MeOH) λ_{max} (log ε) 247 (1.7) nm; IR (dry) ν_{max} 3436, 2965, 2879, 1728, 1712, 1458, 1266, 779 cm^{-1}; ^{1}H-NMR (C_5D_5N, 300 MHz) δ: 1.88 (2H, ddd, *J* = 13, 5.2, 3.5 Hz, H-2), 2.24 (2H, dd, *J* = 5, 12 Hz, H-3), 1.72 (1H, d = 11.5 Hz, H-5), 2.19 (2H, dd, *J* = 6.5, 14 Hz, H-6), 2.87 (1H, ddd, *J* = 16.5, 12.5, 6.5 Hz, H-7α), 2.71 (1H, dd, 16.5, 5.0 H-7β), 1.65 (1H, dd, *J* = 14, 6.5 Hz, H-9), 4.23 (1H, ddd, *J* = 3.0, 13.5, 13.5 Hz, H-11), 5.79 (2H, ddd, *J* = 14.1, 4.5, 12.2 Hz, H-12), 2.02 (1H, dd, *J* = 12.2, 4.5 Hz, H-13), 2.43 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-15α), 1.47 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15β), 2.55 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 2.57 (ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16β), 1.77 (1H, ddd, *J* = 12.5, 12.5, 3.5 Hz, H-18), 1.70 (1H, ddd, *J* = 14.5, 11.5, 4.0 Hz, H-19α), 1.16 (1H, dd, *J* = 14.5, 4.0 Hz, H-19β), 4.46 (1H, ddd, *J* = 13.5, 13.5, 3.0, Hz, H-21), 2.90 (1H, ddd, *J* = 13.5, 13.5, 2.5 Hz, 22α), 1.92 (1H, dd, *J* = 13.5, 13.5 Hz, H-22β), 1.67 (3H, s, H-23), 1.08 (3H, s, H-24), 1.12 (3H, s, H-25), 1.17 (3H, s, H-26), 1.56 (3H, s, H-27), 1.15 (3H, s, H-28), 1.37 (3H, s, H-29), 0.98 (3H, s, H-30), Ac: 2.29 (3H, s, CH_3-CO); ^{13}C-NMR (C_5D_5N, 75 MHz) δ: 214.5 (C-1), 67.9 (C-2), 47.8 (C-3), 45.5 (C-4), 56.6 (C-5), 19.6 (C-6), 35.4 (C-7), 40.3 (C-8), 50.6 (C-9), 38.8 (C-10), 77.4 (C-11), 44.6 (C-12),

54.4 (C-13), 42.4 (C-14), 29.0 (C-15), 28.0 (C-16), 46.6 (C-17), 44.8 (C-18), 27.3 (C-19), 35.5 (C-20), 78.8 (C-21), 43.0 (C-22), 24.2 (C-23), 23.7 (C-24), 17.4 (C-25), 17.3 (C-26), 24.7 (C-27), 25.5 (C-28), 28.7 (C-29), 24.8 (C-30), Ac: 176.2 (CH_3–**C**O), 22.3 (**C**H_3–CO); EI-MS: *m/z* = 500 (M^+, 3, $C_{32}H_{52}O_4$), 482 (15, M^+-H_2O), 472 (21, M^+-CO), 440 (15, M^+-$MeCO_2H$), 291 (10, $C_{19}H_{31}O_2^+$), 263 (11, $C_{18}H_{31}O^+$), 249 (23, $C_{16}H_{25}O_2^+$), 207 (31, $C_{14}H_{23}O^+$), (100, $C_5H_8O_2^+$), 189 (43, $C_{14}H_{21}^+$), 135 (42, $C_9H_{11}O^+$), 109 (34, $C_7H_9O^+$), 95 (44, $C_7H_{11}^+$), 43 (46); HR-EI-MS: *m/z* = 500.7529, calcd. for $C_{32}H_{52}O_4$; 500.7515 observed.

Compound ***3***. White solid, crystalline, m.p. 258–260°C; $[\alpha]_D^{25}$ + 5.43 (*c* 1.4, $CHCl_3$); UV (MeOH) λ_{max} (log ε) 308 (4.28) and 214 (4.26), 267 (3.7) nm; IR (dry) ν_{max} 3348 (OH), 2947, 2877, 1723 (C=C–CO_2), 1707 (CO), 1599, 1534 (C=C), 1451, 1256, 767 cm^{-1};^{1}H-NMR (C_5D_5N, 300 MHz) δ: 1.87 (2H, ddd, *J* = 13, 5.2, 3.5 Hz, H-2), 2.25 (2H, dd, *J* = 4.5, 12 Hz, H-3), 1.74 (1H, d, *J* = 11.5 Hz, H-5), 2.17 (2H, dd, *J* = 6.5, 14 Hz, H-6), 2.87 (1H, ddd, *J* = 16.5, 12.5, 6.5 Hz, H-7α), 2.69 (1H, dd, *J* = 16.5, 5.0 Hz, H-7β), 1.66 (1H, dd, *J* = 14, 6.5 Hz, H-9), 4.47 (1H, ddd, *J* = 3.0, 13.5, 13.5 Hz, H-11), 5.77 (2H, ddd, *J* = 14.1, 4.5, 12.2 Hz, H-12), 2.05 (1H, dd, *J* = 12.2, 4.5 Hz, H-13), 2.44 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-15α), 1.46 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15β), 2.52 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 1.56 (1H, ddd, 13.5, 13.5, 3.0 Hz, H-16β), 1.78 (1H, ddd, *J* = 12.5, 12.5, 3.5 Hz, H-18), 1.71 (1H, ddd, *J* = 14.5, 11.5, 4.0 Hz, H-19α), 1.19 (1H, dd, *J* = 14.5, 4.0 Hz, H-19β), 4.57 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-2), 2.93 (1H, ddd, *J* = 13.5, 13.5, 2.5 Hz, H-22α), 1.95 (1H, dd, *J* = 13.5, 13.5 Hz, H-22α), 1.95 (1H, dd, *J* = 13.5, 13.5 Hz, H-22β), 1.65 (3H, s, H-23), 1.09 (3H, s, H-24), 1.09 (3H, s, H-25), 1.18 (3H, s, H-26), 1.58 (3H, s, H-27), 1.14 (3H, s, H-28), 1.36 (3H, s, H-29), 0.97s (3H, s, H-30), Ang: 6.13 (1H, qq, *J* = 6.6 Hz, H-3), 2.01 (3H, dq, *J* = 6.5, 2.5 Hz, H-4), 1.93 (3H, dqm, *J* = 6.5, 2.2 Hz, H-5); ^{13}C-NMR (C_5D_5N, 75 MHz) δ: 214.2 (C-1), 68.4 (C-2), 47.7 (C-3), 45.8 (C-4), 56.9 (C-5), 19.4 (C-6), 35.5 (C-7), 40.3 (C-8), 50.6 (C-9), 38.7 (C-10), 78.1 (C-11), 44.6 (C-12), 54.8 (C-13), 42.3 (C-14), 29.2 (C-15), 28.4 (C-16), 46.7 (C-17), 44.5 (C-18), 27.8 (C-19), 35.4 (C-20), 78.8 (21), 43.5 (C-22), 24.0 (C-23), 23.8 (C-24), 17.6 (C-25), 17.3 (C-26), 24.8 (C-27), 25.6 (C-28), 28.6 (C-29), 24.9 (C-30), Ang: 168.3 (C-1), 128.0 (C-2), 137.3 (C-3), 15.9 (C-4), 20.6 (C-5); EI-MS: *m/z* = 540 (M^+, 3, $C_{35}H_{56}O_4$), 518 (12, M^+-H_2O), 512 (27, M^+-CO), 440 (15, M^+-$C_5H_8O_2$), 291 (10, $C_{19}H_{31}O_2^+$), 263 (11, $C_{18}H_{31}O^+$), 249 (23, $C_{16}H_{25}O_2^+$), 207 (31, $C_{14}H_{23}O^+$), (100, $C_5H_8O_2^+$), 189 (43, $C_{14}H_{21}^+$), 135 (42, $C_9H_{11}O^+$), 109 (34, $C_7H_9O^+$), 95 (44, $C_7H_{11}^+$), 83 (45), 82 (34); HR-EI-MS: *m/z* = 540.8167, calcd. for $C_{35}H_{56}O_4$; 540.8143 observed.

Compound ***4***. White solid, amorphous, m.p. 267-268°C; $[\alpha]_D^{25}$ + 6.43 (*c* 1.4, $CHCl_3$); UV (MeOH) λ_{max} (log ε) 347 (4.55), 284 (4.56), 253 (4.22) 234 (2.7) nm; IR (dry) ν_{max} 2955, 2885, 1738, 1690, 1635, 1593, 1465, 1260, 926, 807, 764 cm^{-1};^{1}H-NMR (C_5D_5N, 300 MHz) δ: 1.86 (2H, ddd, *J* = 13, 5.2, 3.5 Hz, H-2), 2.24 (2H, dd, *J* = 4.5, 12 Hz, H-3), 1.73 (1H, d, *J* = 11.5 Hz, H-5), 2.18 (2H, dd, *J* = 6.5, 14 Hz, H-6), 2.84 (1H, ddd, *J* = 16.5, 12.5, 6.5 Hz, H-7α), 2.68 (1H, dd, 16.5, 5.0 Hz, H-7β), 1.62 (1H, dd, *J* = 14, 6.5 Hz, H-9), 4.29 (1H, ddd, *J* = 3.0, 13.5, 13.5 Hz, H-11), 5.77 (2H, ddd, *J* = 14.1, 4.5, 12.2 Hz, H-12), 2.06 (1H, dd, *J* = 12.2, 4.5 Hz, H-13), 2.45 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-15α), 1.45 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15α), 1.45 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15β), 2.51 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 1.55 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 1.55 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16β), 1.79 (1H, ddd, *J* = 12.5, 12.5, 3.5 Hz, H-18), 1.72 (1H, ddd, *J* = 14.5, 11.5, 4.0 Hz, H-19α), 1.18 (1H, dd, *J* = 14.5, 4.0 Hz, H-19β), 4.29 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-21), 2.92 (1H, ddd, *J* = 13.5, 13.5, 2.5 Hz, H-22α), 2.89 (1H, dd, *J* = 13.5, 13.5 Hz, H-22β), 1.66 (3H, s, H-23), 1.09 (3H, s, H-24), 1.08 (3H, s, H-25), 1.15 (3H, s, H-26), 1.61 (3H, s, H-27), 1.18 (3H, s, H-28), 1.39 (3H, s, H-29), 0.96 (3H, s, H-30), Ang: 6.13 (1H, qq, *J* = 6.6 Hz, H-3), 2.01 (3H, dq, *J* = 6.5, 2.5 Hz, H-4), 1.93 (3H, dqm, *J* = 6.5, 2.2 Hz, H-5), Ac: 2.29 (3H, s, CH_3–CO); ^{13}C-NMR (C_5D_5N, 75 MHz) δ: 214.8 (C-1), 68.3 (C-2), 47.6 (C-3), 45.9 (C-4), 56.6 (C-5), 19.3 (C-6), 35.5 (C-7), 40.2 (C-8), 50.6 (C-9), 38.8 (C-10), 77.9 (C-11), 44.5 (C-12), 54.7 (C-13), 42.7 (C-14), 29.3 (C-15), 27.9 (C-16), 46.4 (C-17), 44.6 (C-18), 27.6 (C-19), 35.5 (C-20), 81.8 (C-21), 43.6 (C-22), 24.1 (C-23), 23.8 (C-24), 17.5 (C-25), 17.1 (C-26), 24.8 (C-27), 25.7 (C-28), 28.8 (C-29), 24.6 (C-30), Ang: 168.3 (C-1), 128.0 (C-2), 137.3 (C-3), 15.9 (C-4), 20.6 (C-5); Ac: 176.2 (CH_3–**C**O), 22.3 (**C**H_3–CO); EI-MS: *m/z* = 582 (M^+, 3, $C_{37}H_{58}O_5$), 564 (12, M^+-H_2O), 554 (27, M^+-CO), 522 (15, M^+-$MeCO_2H$), 464 (15, M^+-$C_5H_8O_2$), 291 (10, $C_{19}H_{31}O_2^+$), 263 (11, $C_{18}H_{31}O^+$), 249 (23, $C_{16}H_{25}O_2^+$), 207 (31, $C_{14}H_{23}O^+$), (100, $C_5H_8O_2^+$), 189 (43, $C_{14}H_{21}^+$), 135 (42, $C_9H_{11}O^+$), 109 (34, $C_7H_9O^+$), 95 (44, $C_7H_{11}^+$), 83 (45), 82 (56), 43 (78); HR-EI-MS: *m/z* = 582.8334, calcd. for $C_{37}H_{58}O_5$; 582.8343, observed.

Compound ***5***. White solid, crystals, m.p. 264–268°C; $[\alpha]_D^{25}$ + 5.43 (*c* 1.4, $CHCl_3$); UV (MeOH) λ_{max} (log ε) 349 (4.55), 286 (4.56), 254 (4.22), 247 (1.7) nm; IR (dry) ν_{max} 3133, 2940, 2870, 1745, 1620, 1527, 1450, 1250, 923, 806, 791, 760 cm^{-1};^{1}H-NMR (C_5D_5N, 300 MHz) δ: 1.87 (2H, ddd, *J* = 13, 5.2, 3.5 Hz, H-2), 4.35 (2H, dd, *J* = 4.5, 12 Hz, H-3), 1.76 (1H, d, *J* = 11.5 Hz, H-5), 2.17 (1H, dd, *J* = 6.5, 14 Hz, H-6), 2.83 (1H, ddd, *J* = 16.5, 12.5, 6.5 Hz, H-7α), 2.69 (1H, dd, *J* = 16.5, 5.0 Hz, H-7β), 1.63 (1H, dd, *J* = 14, 6.5 Hz, H-9), 4.29 (1H, ddd, *J* = 3.0, 13.5, 13.5 Hz, H-11), 5.78 (2H, ddd, *J* = 14.1, 4.5, 12.2 Hz, H-12), 2.07 (1H, dd, *J* = 12.2, 4.5 Hz, H-13), 2.44 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-15α), 1.46 (1H, ddd, *J* = 13.5, 13.5, 3.1 Hz, H-15β), 2.54 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16α), 1.56 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-16β), 1.78 (1H, ddd, *J* = 12.5, 12.5, 3.5 Hz, H-18), 1.73 (1H, ddd, *J* = 14.5, 11.5, 4.0 Hz, H-19α), 1.17 (1H, dd, *J* = 14.5, 4.0 Hz, H-19β), 4.46 (1H, ddd, *J* = 13.5, 13.5, 3.0 Hz, H-21), 2.97 (1H, ddd, *J* = 13.5, 13.5, 2.5 Hz, H-22α), 1.90 (1H, dd, *J* = 13.5, 13.5 Hz, H-22β), 1.65 (3H, s, H-23), 1.10 (3H, s, H-24), 1.14 (3H, s, H-25), 1.19 (3H, s, H-26), 1.60 (3H, s, H-27), 1.17 (3H, s, H-28), 1.37 (3H, s, H-29), 0.99 (3H, s, H-30), 2 × Bz: 8.04 (1H, d, *J* = 7.2 Hz, H-2), 7.41 (1H, t, *J* = 7.2 Hz, H-3), 7.53 (1H, dt, *J* = 7.2, 2.5 Hz, H-4), 7.41 (1H, t, *J* = 7.2 Hz, H-5), 8.04 (1H, d, *J* = 7.2 Hz, H-6); ^{13}C-NMR (C_5D_5N, 75 MHz) δ: 214.9 (C-1), 68.5 (C-2), 47.5 (C-3), 46.1 (C-4), 56.7 (C-5), 19.8 (C-6), 35.6 (C-7), 40.3 (C-8), 50.6 (C-9), 38.9 (C-10), 77.8 (C-11), 44.6 (C-12), 54.5 (C-13), 42.6 (C-14), 29.1 (C-15), 28.3 (C-16), 46.5 (C-17), 44.9 (C-18), 27.5 (C-19), 35.5 (C-20), 81.8 (C-21), 44.1 (C-22), 24.2 (C-23), 23.5 (C-24), 17.4 (C-25), 17.4 (C-26), 24.9 (C-27), 25.5 (C-28), 28.9 (C-29), 24.8 (C-30), 2 × Bz: 164.6 (C-1), 129.7 (C-2),

Table 1: Inhibition zones (mm) of **1–5** isolated from *C. sativum* against bacteria.

Comp./organism	**1**	**2**	**3**	**4**	**5**	Std*
E. coli	7.1 ± 1.2	22 ± 2	17 ± 2	8 ± 2	8 ± 2	28 ± 1.2
S. aureus	3.6 ± 1.2	23 ± 2	16 ± 2	8 ± 2	18 ± 2	31 ± 1.2
P. mirabilis	2.4 ± 1.2	22 ± 2	19 ± 2	21 ± 2	10 ± 2	29 ± 1.2
P. aeruginosa	2.2 ± 1.2	29 ± 2	21 ± 2	29 ± 2	19 ± 2	33 ± 1.2
B. cereus	2.2 ± 1.2	23 ± 2	22 ± 2	8 ± 2	8 ± 2	27 ± 1.2
K. pneumonia	0	0	17 ± 2	8 ± 2	8 ± 2	29 ± 1.2
M. luteus	0	0	8 ± 2	8 ± 2	17 ± 2	37 ± 1.2
E. cloacae	0	0	0	0	0	34 ± 1.2

*Imipenem was used as standard.

Table 2: Inhibition zones (mm) of **1–5** isolated from *C. sativum* against fungi.

Comp./organism	**1**	**2**	**3**	**4**	**5**	Std*
T. rubrum	9.1 ± 2	7 ± 2	3 ± 2	2 ± 2	1 ± 2	29 ± 2
C. albicans	7.6 ± 2	5 ± 2	3 ± 2	2 ± 2	2 ± 2	31 ± 2
M. audouinii	5.4 ± 2	6 ± 2	2 ± 2	2 ± 2	1 ± 2	24 ± 2
C. neoformans	6.2 ± 2	6 ± 2	2 ± 2	3 ± 2	1 ± 2	26 ± 2
T. mentagrophytes	9.0 ± 2	5 ± 2	3 ± 2	2 ± 2	1 ± 2	29 ± 2
E. floccosum	6.3 ± 2	6 ± 2	3 ± 2	1 ± 2	2 ± 2	27 ± 2
M. canis	7.6 ± 2	3 ± 2	3 ± 2	3 ± 2	1 ± 2	28 ± 2
A. niger	2.3 ± 2	0	3 ± 2	3 ± 2	1 ± 2	28 ± 2

*Imipenem was used as standard.

Table 3: MICs (μg/mL) of **1–5** isolated from *C. sativum* against bacterial strains.

Comp.	*E. coli*	*P. mirabilis*	*P. aeruginosa*	*M. luteus*	*E. cloacae*	*K. pneumonia*	*B. cereus*	*S. aureus*
1	4 ± 0.5	8 ± 1.5	8 ± 1.5	4 ± 0.5	3 ± 0.5	4 ± 0.5	4 ± 0.5	4 ± 0.5
2	4 ± 0.5	8 ± 1.5	8 ± 1.5	4 ± 0.5	4 ± 0.5	8 ± 1.5	8 ± 1.5	4 ± 0.5
3	4 ± 0.5	16 ± 2.0	8 ± 1.5	8 ± 1.5	5 ± 0.5	16 ± 1.5	16 ± 1.5	4 ± 0.5
4	8 ± 0.5	16 ± 1.5	8 ± 1.0	5 ± 0.5	4 ± 0.5	16 ± 1.5	4 ± 0.5	4 ± 0.5
5	64 ± 2.0	32 ± 2.0	32 ± 2.0	4 ± 0.5	4 ± 0.5	64 ± 2.0	64 ± 2.0	64 ± 2.0

130.0 (C-3), 128.4 (C-4), 133.7 (C-5), 128.4 (C-6), 130.0 (C-7); EI-MS: m/z = 666 (M^+, 3, $C_{44}H_{54}O_5$), 440 (12, M^+-H_2O), 430 (27, M^+-CO), 422 (15, M^+-$2H_2O$), 291 (10, $C_{19}H_{31}O_2^+$), 263 (11, $C_{18}H_{31}O^+$), 249 (23, $C_{16}H_{25}O_2^+$), 207 (31, $C_{14}H_{23}O^+$), 189 (43, $C_{14}H_{21}^+$), 135 (42, $C_9H_{11}O^+$), 105 (34, $C_7H_5O^+$), 109 (34, $C_7H_9O^+$), 95 (44, $C_7H_{11}^+$), 77 (23, $C_6H_5^+$), 65 (23, $C_5H_5^+$); HR-EI-MS: m/z = 666.9283, calcd. for $C_{44}H_{54}O_5$; 666.9273 observed.

2.4. Antiringworm Activity of Ethyl Acetate Extract of Coriandrum sativum Linn. In this study five sheep infected with ringworm disease were selected. For each infected sheep, ethyl acetate extract (10 gram) was suspended in preboiled water (10 Liter). Each of the infected sheep was given bath with the suspension after every eight hours continually for four days. On the fourth day, four of the infected sheep recovered from ringworms' infections, while the fifth test sheep took a longer time (10 days) along with vitamin A injection medication.

*2.5. Antimicrobial Activities of Compounds **1–5**.* Compounds **1–5** were tested for their antibacterial and antifungal activities in terms of inhibition zones, MICs, MBCs, and MFCs using standard procedures [8, 12]. The results of antimicrobial activity of compounds **1–5** are displayed in Tables 1, 2, 3, 4, 5, and 6. Briefly, LB medium 20 mL was poured in petri plates and after solidification standard inoculum (100 μL) bacteria/fungi concentration 10^7 CFU/mL suspension was poured and dried for 5 min. DMSO was used as negative control while standard drugs Miconazole and Imipenem (10 μg/disc) were used as positive control.

3. Results and Discussion

The methanolic extract of the whole plant was suspended in water and reextracted with various organic solvents. Ethyl acetate soluble portion was subjected to column chromatography on silica gel; elution was carried out with mixture of petroleum ether/ethyl acetate to yield eight (1–8) fractions.

Table 4: MICs (μg/mL) of **1–5** from *C. sativum* against fungal strains.

Comp./organism	*C. albicans*	*C. neoformans*	*M. audouinii*	*A. niger*	*T. mentagrophytes*	*E. floccosum*	*M. canis*	*T. rubrum*
1	4 ± 0.5	4 ± 0.5	8 ± 0.5	0	8 ± 0.5	16 ± 0.5	0	16 ± 1.5
2	4 ± 0.5	8 ± 1.5	16 ± 1.5	0	16 ± 0.5	16 ± 0.5	0	16 ± 1.5
3	4 ± 0.5	8 ± 1.5	16 ± 1.5	0	16 ± 0.5	32 ± 0.5	16 ± 1.5	32 ± 2.0
4	8 ± 1.5	8 ± 1.5	16 ± 1.5	0	64 ± 2.5	32 ± 1.5	16 ± 1.5	16 ± 1.5
5	16 ± 1.5	64 ± 2.0	16 ± 1.5	0	32 ± 1.5	32 ± 2.0	16 ± 1.5	8 ± 1.5

Table 5: MBCs (μg/mL) of **1–5** from *C. sativum* against bacterial strains.

Comp./organism	*E. coli*	*P. mirabilis*	*P. aeruginosa*	*M. luteus*	*E. cloacae*	*K. pneumoniae*	*B. cereus*	*S. aureus*
1	8 ± 1.5	16 ± 1.5	16 ± 1.5	8 ± 1.5	0	8 ± 1.5	9 ± 1.5	8 ± 1.5
2	8 ± 1.5	16 ± 1.5	16 ± 1.5	9 ± 1.5	0	16 ± 1.5	16 ± 1.5	8 ± 1.5
3	8 ± 1.5	33 ± 1.5	16 ± 1.5	16 ± 1.5	0	32 ± 1.5	33 ± 1.5	8 ± 1.5
4	17 ± 1.5	32 ± 1.5	16 ± 1.5	0	0	33 ± 1.5	9 ± 1.5	9 ± 1.5
5	12 ± 1.5	65 ± 1.5	15 ± 1.5	0	0	12 ± 1.5	12 ± 1.5	12 ± 1.5

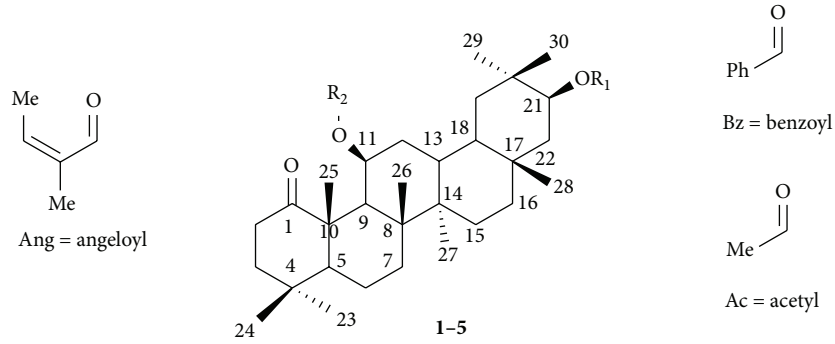
Table 6: MFCs (μg/mL) of **1–5** from *C. sativum* seeds against fungal strains.

Comp.	*C. albicans*	*C. neoformans*	*M. audouinii*	*A. niger*	*T. mentagrophytes*	*E. floccosum*	*M. canis*	*T. rubrum*
1	9 ± 1.5	9 ± 1.5	17 ± 1.5	0	17 ± 1.5	31 ± 1.5	0	31 ± 1.5
2	9 ± 1.5	16 ± 1.5	31 ± 1.5	0	31	31	0	31 ± 1.5
3	9 ± 1.5	16 ± 1.5	31 ± 1.5	0	31 ± 1.5	63 ± 1.5	32 ± 1.5	63 ± 1.5
4	16 ± 1.5	16 ± 1.5	31 ± 1.5	0	122 ± 1.5	61 ± 1.5	3 ± 1.52	31 ± 1.5
5	32 ± 1.5	112 ± 1.5	31 ± 1.5	0	62 ± 1.5	61 ± 1.5	32 ± 1.5	16 ± 1.5

The active fractions 3-4 containing more than two components were subjected to separation on the same silica gel column and eluted with petroleum ether/acetone (7/3) to get semipure triterpenes. Further purification was carried out on preparative HPLC and the column was eluted with MeOH-H_2O (80/20) to get compounds (**1**) (31.3 mg), (t_R = 7.9 min) (**2**), (t_R = 8.1 min) (25.5 mg), (t_R = 8.4 min) (**3**) (31.7 mg), (t_R = 8.7 min) (**4**) (15.8 mg), and (t_R = 9.3 min) (**5**) (37.6 mg).

Compound **1** was obtained as solid needles, m.p. 255–258°C, [α] +5.43°, and displayed an $[M]^+$ ion peak at m/z = 458 in HR-EIMS for $[C_{30}H_{50}O_3]^+$. EIMS gave peaks at m/z = 430 $[M\text{-}28\text{-}CO]^+$, 440 $[M\text{-}18\text{-}H_2O]^+$, and m/z = 412 $[M\text{-}36\text{-}2H_2O]^+$. In IR spectrum, bands were at 1689 cm^{-1} (ketone) and 3404, 3532 (OH) cm^{-1}. Its UV spectrum displayed an absorption band at 216 nm (1.56) for an isolated cyclic ketone [20]. Compound **1** in its ^{1}H-NMR displayed eight singlets (three protons each) at δ 0.97, 1.07, 1.13, 1.16, 1.17, 1.55, 1.66, and 1.38. These singlets were attributed to eight methyl groups present in the basic skeleton of the molecule. Out of these four were gem-methyl. Two methyl groups resonating at δ 1.66, 1.07 (Me-23, Me-24) were gem-methyl present at C-4, other two gem-methyl resonating at 1.38, 0.97 (Me-29, Me-30) were at C-20 and were identified by HMBC (Figure 2). In the same spectrum, there were nine methylene groups that appeared as a complex multiplicity. Peaks at δ 2.22 ddd (J = 13, 5.2, 3.5 Hz) and 1.97 dd (J = 13, 5.2 Hz) were assigned to CH_2-2 and CH_2-3. Similarly, other peaks integrated for two protons were at δ 1.83 d (J = 11.5 Hz) and 2.17 dd (J = 14, 6.5 Hz) for CH_2-6 and CH_2-7 and peaks at δ 2.44 ddd (J = 13.5, 13.5, 3.0 Hz), 1.46 ddd (J = 13.5, 13.5, 3.1 Hz), 2.53 ddd (J = 13.5, 13.5, 3.0 Hz), and 1.56 ddd (J = 13.5, 13.5, 3.0 Hz) were assigned to α β methylene protons of C-15,16. In addition, there was another set of methylene protons that resonated at δ 1.88 ddd (J = 14.1, 4.5, 12.2 Hz, CH_2-12), δ 1.71 ddd (J = 14.5, 11.5, 4.0 Hz, H-19α), δ 1.17 dd (J = 14.5, 4.0 Hz, H-19β), δ 2.91 ddd (J = 13.5, 13.5, 2.5 Hz, H-22α), and δ 1.91 dd (J = 13.5, 13.5 Hz, H-22β). ^{1}H-NMR spectrum of compound **1** revealed six methine protons. Out of these, two were in the middle region of NMR (δ 3.29 ddd (J = 14, 6.5, 4.2 Hz) and δ 3.46 ddd (J = 13.5, 13.5, 3.0 Hz)) for hydroxymethine moieties at C-11 and C-21 by NOE irradiation. Remaining four methine protons were identified by peaks at δ 1.83 d (J = 11.5 Hz), 1.64 dd (J = 14, 6.5 Hz), 2.01 dd (J = 12.2, 4.5 Hz), and 1.78 ddd (J = 12.5, 12.5, 3.5 Hz). ^{13}C-NMR of compound **1** displayed 30 peaks for thirty carbons. In ^{13}C-NMR spectrum, peak appeared at δ 214.7 due to carbonyl group and its position was located with the help of HMBC experiments (Figure 2). Various protons bearing fragments were identified with the help of COSY-45° and HOHAHA experiments (Figure 2). These fragments were connected with each other with the help of HMBC technique (Figure 2).

The BB and DEPT ^{13}C-NMR spectrum of **1** showed 30 carbon signals, 8Me, 9CH_2, 6CH, and 7C. The relative stereochemistry of OH groups at C-11 and C-21 in **1** was deduced by NOESY spectrum (Figure 3). In this spectrum, interactions were observed among α-oriented H-8, H-13, H-18, Me-23, and Me-27. In the light of these experimental results, it was concluded that compound **1** has basic skeleton



Compound	1	2	3	4	5
R_1	H	Ac	Ang	Ang	Bz
R_2	H	H	H	Ac	Bz

Figure 1: Presentation of compounds **1–5**.

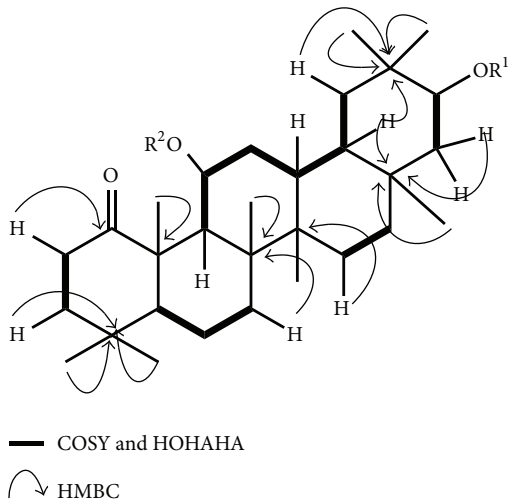


Figure 2: COSY and HOHAHA; HMBC interaction in compounds **1–5**.

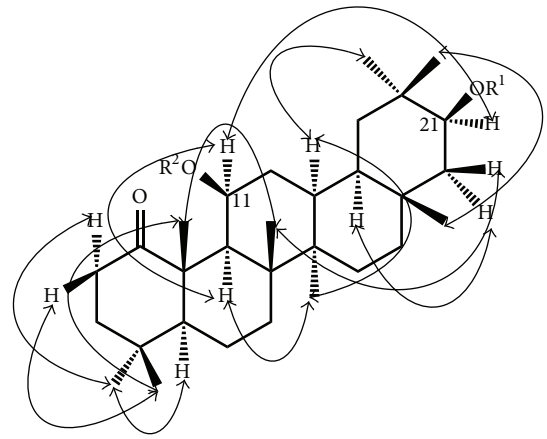


Figure 3: NOESY interaction in compounds **1–5**.

of triterpene as reported earlier [21–23]. Hence, structure for **1** was confirmed as 1-oxo-11β, 21β-dihydroxy-oleanane (Figure 1).

Compound **2** was acetyl derivative of **1** as in HR-EIMS molecular ion peak was at m/z = 500.7515 for $C_{32}H_{52}O_4$. ^{1}H-NMR spectrum of **2** was very close to **1** except for presence of an extra peak at δ 2.29 for three protons. Presence of acetyl moiety in **2** was proved by ^{13}C-NMR spectrum. In this spectrum, in addition to other peaks, there were two more peaks present at δ 176.2 and δ 22.3 which were assigned to an acetyl group. Position of the acetyl group was located at C-21 with the help of HMBC and NOE experiments (Figures 2 and 3). The DEPT ^{13}C-NMR showed 32 carbon signals, 9Me, 9CH_2, 6CH, and 8C. Hence, the proposed structure of **2** was 1-oxo-11β-hydroxy-21β-O-acetyloleanane (Figure 1).

Compound **3** was obtained as white solid, crystalline, m.p. 258–260°C, [α] +5.43°. In UV spectrum displayed λ_{max} at 308 (4.28) and 214 (4.26); 267 (3.7) nm indicated presence of α,β-unsaturated ester as a chromophore. Compound **3** showed molecular ion [M^+] peak m/z = 540.8143 in HR-EIMS corresponding to $C_{35}H_{56}O_4$. Therefore, compound **3** was suggested as an angeloyl derivative of **1**. ^{13}C-NMR spectra of **3** were similar to **1** but there were peaks for angelate moiety: H-3 (δ 6.13, 1H, qq, J = 6.6 Hz), CH_3-4 (δ 2.01, 3H, dq, J = 6.5, 2.5 Hz), and CH_3-5 at δ 1.93 [3H, dqm, J = 6.5, 2.2 Hz]; δ 168.3 (C-1), 128.0 (C-2), 137.3 (C-3), 15.9 (C-4), and δ 20.6 (C-5). Therefore, **3** was considered as angeloyl derivative of **1**. Position of angelate was inferred at C-21 by HMBC and NOE interaction between H-21 and an angeloyl proton H-3. The DEPT 13C-NMR spectrum of **3** showed 35 carbon signals, 10Me, 9CH_2, 7CH, and 9C. On the basis of these

results, structure of **3** was concluded as 1-oxo-11β-hydroxy-21β-O-angeloyloleanane.

Compound **4** is colorless, amorphous powder, m.p. 267-268°C, [α] +6.43°; UV spectrum showed compound is UV active by displaying λ_{max} at 347 (4.55), 284 (4.56), 253 (4.22), and 234 (2.7) nm typical for angelic moiety. IR spectrum showed absence of OH groups in the compound. There were peaks at ν_{max} 1723 and 1706 cm^{-1} for ester carbonyl groups. Molecular formula $C_{37}H_{58}O_5$ of compound **4** was established with the help of HR-EIMS, displaying molecular ion peak at m/z = 582. In EIMS, fragmentation peak appeared at m/z = 522 [M^+-60] indicating presence of an acetate. Another peak at m/z = 482 was due to loss of angelic acid from the parent molecule. Therefore, it was considered as diester of acetic acid and angelic acid of **1**.

NMR (^{1}H- and ^{13}C-) spectra of **4** were almost same as **3** except for presence of an extra acetyl moiety. It was also proved by DEPT ^{13}C-NMR spectrum which showed 37 carbon signals, 11Me, 9CH_2, 7CH, and 10C. Position of the acetate moiety was deduced at C-21 by HMBC and NOE interaction. Thus, structure of 4 was concluded as 1-oxo-11β-O-acetyl-21β-O-angeloyloleanane.

Fractions 6–8 were combined and chromatographed over silica gel column. Active fraction was subjected to a reversed-phase preparative HPLC and afforded a pure compound **5** (t_R = 9.3 min). It was white solid, m.p. 264–268°C, optically active and displayed [α] +5.43° in polarimeter. Presence of chromophore was revealed by displaying λ_{max} peaks at 349 (4.55), 286 (4.56), 254 (4.22), and 247 (1.7) nm in UV. Presence of aromatic moiety was indicated by IR spectrum. Peak at ν_{max} 3133 (Ar–H stretching) and peaks at 806, 791, and 760 cm^{-1} suggested monosubstituted benzene ring. Presence of the ester carbonyl was proved by peaks at 1745 and 1725 cm^{-1}. Molecular composition $C_{44}H_{58}O_5$ of **5** was proposed by HR positive ion FAB-MS in which it indicated an $[M]^+$ ion peak at m/z = 667. In EIMS, fragmentation pattern revealed presence of two benzoic acid species by displaying peaks at m/z = 544 [M-122-benzoic acid]$^+$ and 422 [M-2 × 122-2 × benzoic acid]$^+$. The 1H, 13C-NMR spectra of 5 were close to **1** except for presence of (double) peaks in aromatic region at δ 8.04 (2H, d, J = 7.2 Hz), 7.41 (2H, t, J = 7.2 Hz), 7.53 (1H, dt, J = 7.2, 2.5 Hz) δ 164.6 [2 × CO s]), 2 × 5CH (δ 129.7 d, 130.0 d, 130.0 d, 128.4 d, 128.4 d), and 2 × C (133.7). Therefore, it was suggested as diester of benzoic acid of **1** (Figure 1). Positions of the ester moieties were deduced by HMBC interactions. The H-11 (δ 4.29) displayed interaction with carbonyl carbon of ester (δ 164.6); similarly, H-21(δ 4.46) displayed interaction with other carbonyl (δ 164.4) in HMBC spectrum (Figure 2). Therefore, ester moieties were suggested at C-11 and C-21, respectively.

On this basis, compound **5** was declared as 1-oxo-11β,21β-O-dibenzoyloleanane. The DEPT 13C-NMR spectrum of **5** showed 44 carbon signals, 8Me, 9CH_2, 16CH, and 11C. On this basis, compound **5** was declared as 1-oxo-11β,21β-O-dibenzoyloleanane. According to our knowledge, compounds **1–5** have not been reported earlier from plant kingdom and hence can be declared as new entities.

Ringworm (*Club Lamb Fungus*) disease in sheep is common and is a matter of intense concern all over the world. The disease once its symptoms appear is not restricted to sheep hosts but is fast transmitted to other animals and human beings who rear up the infected animals. Ethyl acetate extract of whole plant of *Coriandrum sativum* Linn. was effectively employed to heal ringworm disease in sheep.

Isolated compounds displayed activity against used microbes. Compounds **2** and **4** were most active against *P. aeruginosa* with inhibition zones (29 mm), whereas standard (Imipenem) displayed 31 mm. Compounds **1–5** displayed no activity against *E. coli*. Compounds **2** and **3** were found to be also inactive against *M. luteus and K. pneumonia* but displayed activity against *E. coli* (inhibition zones 22 and 17 mm) compared to standard (33 mm). Compounds **2–4** also displayed moderate activity against *P. mirabilis, P. aeruginosa*, and *B. cereus*. Same trend of biological activities of compounds **1–5** isolated from *C. sativum* was found in terms of MICs against used microbes.

4. Conclusions

The ethyl acetate extract exhibited excellent antiringworms activity and antibacterial activity. We have for the first time isolated oleanane type compounds (**1–5**) from *C. sativum* Linn. This study reveals that these oleananes could be potential bioactive compounds that will be useful for the development of new tools for the control of diseases.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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