SHORT REPORT

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Cyrneine E, A New Cyathane Diterpene from *Sarcodon cyrneus*

Maria Carla Marcotullio*, Ornelio Rosati, Federica Maltese and Federica Messina

Dipartimento di Chimica e Tecnologia del Farmaco, Università degli Studi di Perugia, Via del Liceo, 1, 06123 Perugia, Italy

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Abstract: A new cyathane diterpene, cyrneine E (**1**) was isolated from the mushroom *Sarcodon cyrneus*. The structure of the novel compound was determined by analysis of its spectroscopic data.

Keywords: Cyrneine E; *Sarcodon cyrneus;* cyathane diterpenes.

1. Plant Source

Continuing our phytochemical studies on *S. cyrneus* (Bankeraceae), we isolated and identified a new cyathane diterpene named cyrneine E (**1**).

The mushroom was collected in October 2004 near Perugia (Italy) and identified by Prof. R. Pagiotti. A voucher specimen (RP#62) is deposited at the Dipartimento di Biologia Applicata-Sezione Biologia Vegetale e Geobotanica, Università degli Studi di Perugia.

2. Previous Studies

Cyathane diterpenes, cyrneines A and B [1], C and D [2] and glaucopine C [2, 3] were previously isolated from *S. cyrneus*. Cyrneines A and B resulted able to induce neurite outgrowth in a Rac1-dependent mechanism in PC12 cells [4], while cyrneine C and D failed to induce neurite outgrowth in PC12 cells, showing only a weak activity in inducing NGF expression in 1321N1 human astrocytoma cells [2].

3. Present Study

The lyophilized fruiting bodies of *S. cyrneus* (30 g) were extracted with MeOH (1 L) at room temperature for 24 h and then filtered. The filtrate was concentrated under vacuum to give 8.6 g of crude extract that was diluted with EtOAc and washed three times with H_2O. The organic phase was dried over Na_2SO_4, filtered and evaporated giving 1.84 g of a brown syrup (MII) that was subject to

* Corresponding author: E-mail: marcotu@unipg.it; mariacarla.marcotullio@unipg.it
Tel.: +39-075-585-5104; Fax: +39-075-585-5116

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column chromatography (silica gel, CH_2Cl_2-EtOAc 10%→100%) yielding 16 fractions. An amount (37 mg) of fraction MII-4 (54 mg) (eluted with CH_2Cl_2-EtOAc 9:1) was further purified (silica gel, CH_2Cl_2-EtOAc 19:1) to give 3 fractions (MII4 a-c). Fraction MII4-a was constituted by pure cyrneine E (**1**) (15 mg).

Cyrneine E ***(1)****:* yellowish oil; $[\alpha]^{25.4}_D$: - 78.2° (*c* 0.22, CH_2Cl_2); IR ν_{max} (neat): = 2930, 1700, 1637, 1450 cm^{-1}; ^1H NMR (400 MHz, CD_3OD): δ (ppm) = 1.00 (3H, s, H-16), 1.15 (3H, s, H-17), 1.01 (3H, d, *J* = 6.9 Hz, H-19 or H-20), 1.03 (3H, d, *J* = 7.0 Hz, H-20 or H-19), 1.14-1.16 (2H, m, H-8), 1.17-1.28 (1H, m, H-7α), 2.00-2.10 (1H, m, H-7β), 2.90-3.05 (4H, m, H-2, H-10), 3.35 (1H, d, *J* = 13.9 Hz, H-13α), 3.45 (1H, dd, *J* = 2.0, 11.5 Hz, H-5), 3.88 (1H, ddd, *J* = 2.9, 5.6, 13.9 Hz, H-13β), 6.82 (1H, m, H-11), 9.31 (1H, s, H-15); ^{13}C NMR (100.62 MHz, CD_3OD): δ (ppm) = 12.1 (CH_3, C-17), 18.7 (CH_3, C-16), 20.5 (CH_3, C-19*), 20.9 (CH_3, C-20*), 27.2 (CH, C-18), 29.0 (CH_2, C-7), 31.6 (CH_2, C-8), 31.8 (CH_2, C-10), 34.3 (CH_2, C-13), 40.1 (CH_2, C-2), 40.3 (CH, C-5), 54.3 (C, C-6), 54.9 (C, C-9), 135.5 (C, C-4), 137.1 (C, C-3), 135.8 (C, C-12), 153.7 (CH, C-11), 193.1 (CH, C-15), 211.2 (C, C-1), 221.7 (C, C-14); MS (rel. int.): *m/z* 314 [M^+] (26), 299 (100), 271 (25), 243 (19); HREIMS: *m/z* 314.4164 (calcd. 314.4186 for $C_{20}H_{26}O_3$).

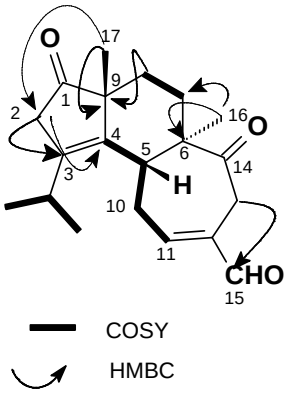

Figure 1. Key COSY and HMBC correlations in cyrneine E (**1**) isolated from *S. cyrneus*.

Compound **1,** was isolated as yellowish oil. The MS of **1** revealed a molecular weight of 314.4164 consistent with the molecular formula $C_{20}H_{26}O_3$, which was confirmed by HREIMS analysis. The IR spectrum showed absorptions at 1700, 1637 cm^{-1} implying two carbonyl functions confirmed by the signals at δ 221.7 and 211.2 ppm in a JMODXH (J-modulated spin-echo; C, H) spectrum. The carbon resonance at δ 193.1 (CH), 153.7 (CH) and 135.8 (C) ppm showed the presence of an α,β-unsaturated aldehyde. The olefinic signals at δ 137.1 and 135.5 indicated the presence of a tetrasubstituted double bond. Furthermore, in the spectrum there were the signals of four methyls (δ 12.1, 18.7, 20.5 and 20.9 ppm), five methylenes (δ 29.0, 31.6, 31.8, 34.3 and 40.1 ppm), two methines (δ 27.2 and 40.3 ppm) and finally two quaternary carbon signals at δ 54.3 and 54.9 ppm. The ^1H NMR spectrum confirmed the presence of the unsaturated aldehyde by signals at δ 9.31 and 6.82 ppm. The four methyls appeared as two singlets (δ 1.00 and 1.15 ppm) and two doublets (δ 1.01 and 1.03 ppm). The combined use of H-H COSY and HMQC evidenced the presence of three spin systems (Figure 1). These fragments were connected by HMBC correlations between H-2 protons (δ 2.90-3.05 ppm) and C-9 (δ 54.9 ppm) and C-17 (δ 12.1 ppm), H-17 (δ 1.15 ppm) and C-2 (δ 40.1 ppm), C-9 (δ 54.9 ppm) and C-1 (δ 211.2 ppm), between H-16 (δ 1.00 ppm) and C-7 (δ 29.0ppm), C-6 (δ 54.3 ppm), C-14 (δ 221.7 ppm), H-13α (δ 3.35 ppm) and C-15 (δ 193.1 ppm) (Figure 1).

All these data allowed us to identify compound **1** as 1-oxo-cyathin B_2 [5,6]. The relative stereochemistry of cyrneine E was deduced from NOESY correlations (Figure 2).

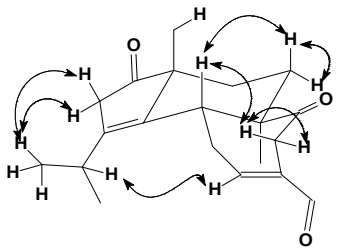

Figure 2. Key NOESY correlations in cyrneine E (**1**) isolated from *S. cyrneus*.

Supporting Information

Supporting information accompanies this paper on http://www.acgpubs.org/RNP

References

[1] M. C. Marcotullio, R. Pagiotti, F. Maltese, Y. Obara, T. Hoshino, N. Nakahata and M. Curini (2006). Neurite outgrowth activity of cyathane diterpenes from *Sarcodon cyrneus*, cyrneines A and B, *Planta Med.* **72**, 819-823.

[2] M. C. Marcotullio, R. Pagiotti, F. Maltese, G. N.Oball-Mond Mwankie, T. Hoshino, Y. Obara and N. Nakahata (2007). Cyathane diterpenes from *Sarcodon cyrneus* and evaluation of their activities of neuritegenesis and nerve growth factor production, *Bioorg. Med. Lett.* **15,** 2878-2882.

[3] M. C. Marcotullio, R. Pagiotti,V. Campagna, F. Maltese, G. Fardella, G. Altinier and A. Tubaro (2006). Glaucopine C, a new diterpene from the fruiting bodies of *Sarcodon glaucopus*, *Nat. Prod. Res*. **20**, 917–921.

[4] Y. Obara, T. Hoshino, M. C. Marcotullio, R. Pagiotti and N. Nakahata (2007). A novel cyathane diterpene, cyrneine A, induces neurite outgrowth in a Rac1-dependent mechanism in PC12 cells, *Life Sci*. **80**, 1669–1677.

[5] W. A. Ayer and S.P. Lee (1979). Metabolites of bird's nest fungi. Part 11. Diterpenoid metabolites of *Cyathus earlei* Lloyd, *Can. J. Chem.* **57**, 3332-3337.

[6] K. Kin and J. K. Cha (2009). Total synthesis of Cyathin A_3 and Cyathin B_2, *Angew. Chem. Int. Ed.* **48**, 5334-5336.