Tremellin, a Novel Symmetrical Compound, from the Basidiomycete *Tremella aurantialba*

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A novel, highly symmetrical compound, named tremellin (1), was isolated from the fruiting bodies of the basidiomycete *Tremella aurantialba*. Its structure was established by spectroscopic means and X-ray analysis.

**Introduction.** – *Tremella aurantialba* is one of the edible mushrooms that has been used as antihelatitis agent and immunostimulant [1]. The fungus is distributed in Yunnan, Sichuan, Xizang, Gansu, and Jiangxi provinces of China [2]. As part of our studies on the active metabolites from higher fungi [3–9], the chemical constituents of *Tremella aurantialba* were investigated. The present report deals with the structure elucidation of a new compound 1, named tremellin, which was isolated from the fruiting bodies of this fungus. Tremellin (1) has a simple, highly symmetric structure.

![Chemical structure of tremellin](image)

**Results and Discussion.** – *T. aurantialba* (dry weight 3.5 kg) was extracted with CHCl₃/MeOH 1:1. Repeated chromatography afforded tremellin (1; 10 mg) as colorless needles with a molecular formula of C₆H₆O₄ (HR-MS: m/z 142.0264 (M⁺, C₁₃₅H₁₃₅O₄; calc. 142.0266). The ¹H- and ¹³C-NMR and IR data established its structure as tetrahydro-1H,4H-furo[3,4-c]furan-1,4-dione (1).

Three signals in the ¹³C-NMR (DEPT) spectrum of 1 were recognized (1 C, 1 CH₂, 1 CH), which were assigned to a carbonyl (δ 175.5), an oxymethylene (δ 68.9), and a methine group (δ 40.7). The three signals in the ¹H-NMR spectrum at δ (H) 4.67 (d, J = 9.7 Hz, H₁–C(3), H₆–C(6)), 4.07 (m, H₁–C(3), H₂–C(6)), and 3.51 (m, H₁–C(3a), H₁–C(6a)) revealed a highly symmetrical structure and led to the deduction of two possible structures 1 and 2. In the IR spectrum of tremellin, the carbonyl absorption at 1765 cm⁻¹ indicated the presence of a γ-lactone moiety, and the fragment ion m/z 98 ([M – CO₂]⁺) in the EI-MS confirmed the presence of this γ-lactone unit.
The relative configuration of tremellin (1) was established by a single-crystal X-ray-analysis (Figs. 1 and 2).

**Experimental Part**

**General.** M.p.: uncorrected. IR: KBr pellets; in cm$^{-1}$. $^1$H- and $^{13}$C-NMR: Bruker DRX-500 spectrometers, δ in ppm, J in Hz. MS. VG Autospect-3000 spectrometer; m/z (rel. int).

**Mushroom Material.** The fruiting bodies of the basidiomycete *Tremella aurantialba* were provided by the Kunming Institute of Edible Mushroom.

**Extraction and Isolation.** The entire fruiting bodies of *Tremella aurantialba* (dry weight 3.5 kg) were extracted with CHCl$_3$/MeOH 1:1 at r.t. (4 times). The residue was first extracted with petroleum ether and then with AcOEt. The AcOEt extract (36.5 g) was submitted to column chromatography (silica gel, gradient CHCl$_3$/AcOEt 10:0, 9:1, 8:2). The combined fractions (CHCl$_3$/AcOEt 9:1) were purified by recrystallization from petroleum ether/Et$_2$O to give pure tremellin (1, 10 mg).

**Tremellin (7H,10m rel-(3aR,6aR)-Tetrahydro-1H,4H-furo[3,4-c]furan-1,4-dione; 1).** Colorless crystals. M.p. 130–133°C (petroleum ether/Et$_2$O). IR (KBr): 3514, 2985, 1765, 1477, 1370, 1176. $^1$H-NMR (CDCl$_3$): 3.51 (m, 2 H); 4.54 (m, 2 H); 4.67 (d, $J = 9.7$, 2 H). $^{13}$C-NMR (CDCl$_3$): 40.7 (CH$_2$); 68.9 (CH); 175.5 (C=O). HR-ESI-MS: 142.0264 (C$_6$H$_6$O$_4$; M$^+$; calc. 142.0266). EI-MS: 142 (48), 98 (23), 84 (34), 69 (100), 55 (72), 54 (76).

**X-Ray Analysis.** Crystal data: C$_2$H$_2$O$_2$. $M = 142$, monoclinic, space group $P2_1/a$; $a = 11.3010(11)$, $b = 9.1700(10)$, $c = 17.6090(21)$Å, $\beta = 99.78(5)^\circ$, $V = 1798.3(3)$ Å$^3$, $Z = 12$. Final $R_L$ and $R_w$ values were 0.064 and 0.052, resp. A total of 2557 reflections were recorded in the $\omega$ scanning mode with a MAC-DIP-2030K.
diffractometer with graphite-monochromated Mo-Kα scanning radiation. The structure was solved by the direct method (SHELXS-86).

Crystallographic data (excluding structure factors) have been deposited with the Cambridge Crystallographic Data Centre. Copies of the data can be obtained, free of charge, on application to the CCDC, 12 Union Road, Cambridge CB2 1EZ UK (fax: +44(1223) 336033; e-mail: deposit@ccdc.ac.uk).

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REFERENCES


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