3,7-Bis(hydroxymethyl)-1-benzoxepin-5(2*H*)-one, a Novel Metabolite from Cultures of the Fungus *Marasmiellus ramealis* (Bull. *ex* Fr.) Singer†

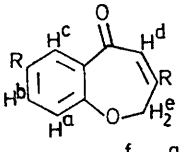
By JOHN K. HOLROYDE, ALEX F. ORR, and VIKTOR THALLER*
(*The Dyson Perrins Laboratory, University of Oxford, Oxford* OX1 3QY)

Summary The structure of the title compound was established by spectrometry and unambiguous synthesis of a simple transformation product.

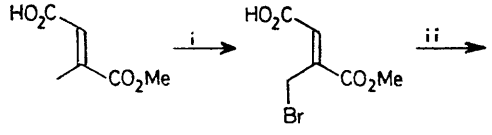
MARASIN (**1**) and 3-methyl-8-hydroxyisocoumarin are metabolites[1] of *Marasmiellus ramealis* (Bull. *ex* Fr.) Singer (tribus Collybieae). We now report the isolation of 3,7-bis(hydroxymethyl)-1-benzoxepin-5(2*H*)-one (**2**) (5·6 mg l^{-1} culture fluid) from cultures of the same fungus. This new metabolite represents a ring system hitherto unknown in natural product chemistry. Examples of synthetic 1-benzoxepin-5(2*H*)-ones have only recently been reported.[2]

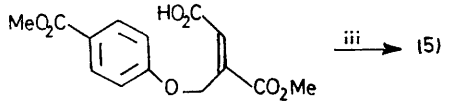
$HC{\equiv}C-C{\equiv}C-CH{=}C{=}CH-CH_2-CH_2OH$

(1)



(2) R = $CH_2^fOH^g$
(3) R = $CH_2^fOCOCH_3^h$
(4) R = CH^iO
(5) R = $CO_2CH_3^j$





SCHEME
Reagents: i, *N*-Bromosuccinimide; ii, *p*-$MeO_2C{\cdot}C_6H_4{\cdot}OH$, KOH, H_2O; iii, a, $SOCl_2$, b, $AlCl_3$, CH_2Cl_2.

The water-soluble diol‡ (**2**) (m.p. 100—100·5 °C) shows i.r. absorptions (KBr disc) at 1660 and 3350 cm^{-1} which establishes the presence of conjugated carbonyl and hydroxy-groupings. Treatment of (**2**) with acetic anhydride–pyridine gave a diacetate (**3**) while oxidation (MnO_2, CH_2Cl_2) afforded an unstable dialdehyde (**4**). These transformations imply the presence of two allylic and/or benzylic

† This fungus was formerly called *Marasmius ramealis* (Bull. *ex* Fr.) Fr. It was reallocated within the family Tricholomataceae in a recent attempt to classify the order Agaricales. (*Cf.* R. Singer, 'The Agaricales in Modern Taxonomy,' J. Cramer, Weinheim, 1962).

‡ All new compounds gave satisfactory analytical and spectroscopic data.

TABLE

τ values and coupling constants (J Hz) for compounds (2)—(5)[a]

Proton	H^a (1H)	H^b (1H)	H^c (1H)	H^d (1H)	H^e (2H)	H^f (2+2H)	H^g (2H)	H^h (3+3H)	H^i (1+1H)	H^j (3+3H)
(2)[b]	2·96 (d, 8)	2·47 (dd, 8 and 2)	2·09 (d, 2)	3·53br (s)	5·30 (s)	5·35 (s) 5·65 (s)	5·30— 5·80			
(3)	3·04 (d, 9)	2·60 (dd, 9 and 2)	2·11 (d, 2)	3·66br (s)	5·00 (s)	5·30 (s) 5·39 (s)		7·91(s) 7·99 (s)		
(4)	2·75 (d, 8)	1·92 (dd, 8 and 2)	1·43 (d, 2)	2·92 (s)	4·94 (s)				−0·01 (s) 0·21 (s)	
(5)	2·95 (d, 9)	1·96 (dd, 9 and 2)	1·46 (d, 2)	2·83 (s)	5·00 (s)					6·13 (s) 6·15 (s)

[a] Spectra were recorded at 90 MHz in CCl_4 except for compound (2) which was examined in acetone. [b] The ^{13}C n.m.r. spectrum of this compound is consistent with the structure assigned.

hydroxymethyl groups. Further oxidation of (4) (MnO_2, KCN, MeOH) gave the diester (5). Elemental analysis and the mass spectrum (M^+ m/e 220) of (2) showed its constitution to be $C_{12}H_{12}O_4$.

N.m.r. data for compounds (2)—(5) are recorded in the Table. The 1,2,4 aromatic substitution pattern is clearly seen for all four compounds and the deshielding effect of the neighbouring carbonyl groups on H^c is consistent with the isomer shown. The singlet at τ 3·53 establishes the presence of the trisubstituted double bond in (2) while the resonance at τ *ca.* 5 in the spectra of all four compounds suggests that an allyl aryl ether is present.

Our assignment of the structure (2) to the new metabolite was confirmed by synthesising the diester (5) in a three-step sequence as outlined in the Scheme.

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[1] G. Bendz, *Arkiv Kemi*, 1959, **14**, 305, 511.
[2] H. Hofmann and P. Hofmann, *Chem. Ber.*, 1973, **106**, 3571; *Annalen*, 1974, 1301; H. Hofmann and J. H. Haberstroh, *ibid.*, 1973, 2032.