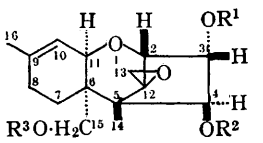
The Constitution of Diacetoxyscirpenol

By E. FLURY, R. MAULI, and H. P. SIGG

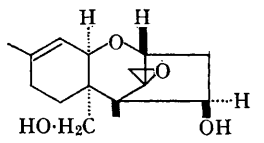
(*Pharmazeutisch-chemische Forschungslaboratorien, Sandoz A.G., Basel, Switzerland*)

DURING our search for biologically active mould metabolites we have isolated a neutral alcohol, $C_{19}H_{26}O_7$, from culture filtrates of *Fusarium diversisporum* and *F. sambucinum*,[1] which proved to be identical with diacetoxyscirpenol,[2] recently isolated from *Fusarium scirpi*, *F. equiseti*, and *Gibberella intricans*. Chemical degradation and physicochemical evidence make it possible to assign structure (I) to diacetoxyscirpenol.[3]

The close relationship between scirpentriol (II),[2] $C_{15}H_{22}O_5$, the hydrolysis product of diacetoxyscirpenol (I) and verrucarol (V)[4] $C_{15}H_{22}O_4$, the



(I) $R^1 = H$, $R^2 = R^3 = Ac$

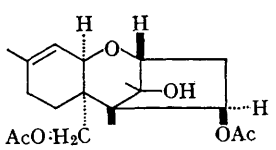


(V)

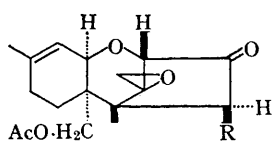
(II) $R^1 = R^2 = R^3 = H$

(III) $R^1 = SO_2Me$, $R^2 = R^3 = Ac$

(IV) $R^1 = R^2 = R^3 = Ac$

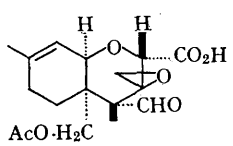


(VI)



(VII) R = OAc

(VIII) R = H



(IX)

[1] The microbiological work, which made these investigations possible, was carried out by Drs. E. Haerri, W. Loeffler, H. Siegle, and Ch. Stoll.

[2] P. W. Brian, A. W. Dawkins, J. F. Grove, H. G. Hemming, D. Lowe, and G. L. F. Norris, *J. Exptl. Bot.*, 1961, **12**, 1.

[3] A. W. Dawkins, J. F. Grove, and B. K. Tidd have deduced the same structure independently and kindly agreed to a simultaneous publication (see following communication).

[4] Ch. Tamm and J. Gutzwiller, *Helv. Chim. Acta*, 1962, **45**, 1726.

sesquiterpene unit of verrucarin A[5], was evident.

The structure of verrucarol (V) has been proved[6] by chemical degradation and interconnection with trichodermin,[7] a metabolite from *Trichoderma* species, whose structure was established by *X*-ray analysis.[8]

The nuclear magnetic resonance (n.m.r.) spectrum of diacetoxyscirpenol (in $CDCl_3$) reveals the presence of a tertiary methyl group (singlet at τ 9·18), one methyl group at a double bond (singlet at τ 8·27), two acetyl groups (singlets at τ 7·95 and 7·86), and a vinyl-proton (doublet at τ 4·46).

The typical AB-system at τ 6·93 and 7·22 (J = 4 c./sec.) suggests an ethylene oxide function with two geminal hydrogen atoms as in verrucarol[6] or in streptolydigin.[9] Reduction of diacetoxyscirpenol methanesulphonate (III) with lithium aluminium hydride and acetylation of the products gave the diacetoxy-hydroxy-compound (VI), which could also be prepared[10,6] by the same reaction sequence from verrucarol (V). Thus scirpentriol is a hydroxy-verrucarol. Location and relative stereochemistry of the additional hydroxy-group can be shown to be as in (I) by the following reactions: Oxidation of diacetoxyscirpenol with chromic oxide–acetic acid produced the formyl acid (IX) and the ketone (VII), which could be reduced by zinc–acetic acid to the ketone (VIII). Therefore scirpentriol must be a 1,2-glycol. Since it is not oxidized by periodic acid or lead tetra-acetate, the secondary hydroxyls have the *trans*-configuration, which was confirmed by the n.m.r. spectrum of diacetoxyscirpenol acetate (IV): the hydrogen at C_4 shows a doublet at τ 4·24 with $J_{3,4}$ = 3 c./sec. while the hydrogen at C_3 gives rise to two doublets at τ 4·78 and 4·83 with $J_{3,4}$ = 3 c./sec. and $J_{2,3}$ = 5 c./sec. A coupling constant of 3 c.p.s. indicates an angle between these hydrogens of about 60° or 120°.

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[5] E. Haerri, W. Loeffler, H. P. Sigg, H. Staehelin, Ch. Stoll, Ch. Tamm and D. Wiesinger, *Helv. Chem. Acta*, 1962, **45**, 839.
[6] J. Gutzwiller, R. Mauli, H. P. Sigg, and Ch. Tamm, *Helv. Chim. Acta*, 1964, **47**, fasc. 8.
[7] W. O. Godtfredsen and S. Vangedal, *Proc. Chem. Soc.*, 1964, 188.
[8] S. Abrahamsson and B. Nilsson, *Proc. Chem. Soc.*, 1964, 188.
[9] K. L. Rinehart, Jr., J. R. Beck, W. W. Epstein, and L. D. Spicer, *J. Amer. Chem. Soc.*, 1963, **85**, 4035.
[10] J. Gutzwiller and Ch. Tamm, *Helv. Chim. Acta*, 1964, **46**, 1786.