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REVISION OF THE ABSOLUTE CONFIGURATION OF TRIOL MOIETY OF GYMNOPRENOLS

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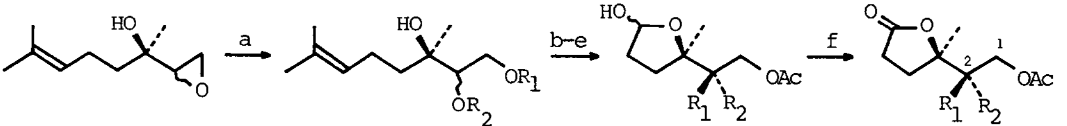
Summary: The absolute configurations of triol moiety of gymnoprenol-A, -B and gymnopilin have been revised as 2R,3S, on the basis of the synthesis of (2S,3R)-lactone diacetate (1a) from (R)-(-)-linalool.

Gymnoprenols are the unique polyisoprenepolyols isolated from an hullucinogenic mushroom, Gymnopilus spectabilis.[2-4] Those occur as a mixture of the homologous series of compounds containing 45 to 60 carbon atoms.

Recently we reported the absolute configuration of the triol moiety of gymnoprenols and gymnopilin by a correlation of the degradation product 1 with the synthetic lactone derived from (2S,3S)-2,3-epoxygeranyl acetate.[1] However, we have found that this assignment should be reversed by the following observations. We wish to report in this communication the revision[5] of the absolute configurations of gymnoprenol-A[2], -B[2] and gymnopilin[3] as 2R,3S, a conclusion based on the synthesis of (2S,3R)-lactone diacetate(1a) from (R)-(-)-linalool.

(2S,3R)-Lactone diacetate 1a has been synthesized from (R)-(-)-linalool by a route shown in scheme I. Although ring opening process of the epoxide 2[6] which, in this case, gave rise to a mixture of C-1 and C-2 formates (3a and 3b) seems to be somewhat complex, two diastereomeric hemiacetal 4a and 4b were obtained after hydrolysis and oxidative cleavage. The two diastereomers 4a and 4b separated by HPLC[7] were converted to the lactone 1a[8] and 1b[9], respectively. The lactone 1a assigned to anti-isomer shows signals identical with those of the lactone derived from gymnoprenols: δ 1.44(3H,S), 2.04(3H,S), 2.09(3H,S), 4.11(1H,dd,J=6.9,12Hz), 4.42(1H,dd,J=3,12Hz), 5.19(1H,dd,J=3,6.9Hz). On the other hand, 2-epi-isomer 1b shows signals at δ 1.50(3H,S), 2.04(3H,S), 2.13

Scheme I



2

3a: R_1=CHO, R_2=H
3b: R_1=H, R_2=CHO

4a: R_1=H, R_2=OAc
4b: R_1=OAc, R_2=H

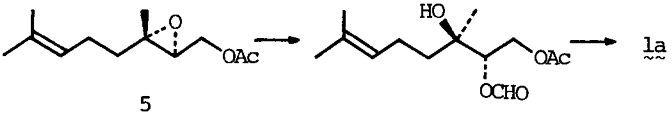
1a: R_1=H, R_2=OAc
1b: R_1=OAc, R_2=H

(a) $HClO_4$/DMF; (b) $NaHCO_3$/MeOH; (c) Ac_2O/Py; (d) OsO_4/Py; (e) $NaIO_4$/aq. dioxane; (f) Jones oxidn.

(3H,S), 4.04(1H,dd,J=8,12.3Hz), 4.51(1H,dd,J=2.9,12.3Hz), 5.18(1H,dd,J=2.9,8Hz), identical to those of (±)-syn-lactone.$^{1)}$

(2S,3R)-Lactone **1a** obtained, however, showed a specific rotation of -6.3° (c, 0.22, $CHCl_3$) which is an opposite sign to that of the degradation product from gymnoprenols.$^{1)}$ The same sign of an optical rotation of (2S,3R)-**1a** with the lactone derived from 2,3-epoxygeranyl acetate **5** mentioned in our previous report$^{1)}$ indicates that C-3 position must be inverted in the epoxide opening.

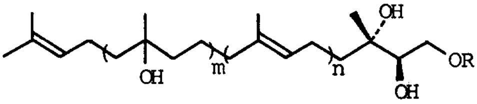
Scheme II



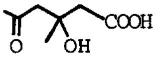
5

Thus, opening of an epoxide ring in this case under acidic condition ($HClO_4$ in DMF) occurs at C-3 with inversion of configuration followed by transesterification from C-3 to C-2.$^{10)}$

Hence the stereochemistry of the lactone derived from **5**$^{1)}$ must be assigned as 2S,3R instead of 2R,3S. Since the lactone obtained from gymnoprenols is an enantiomer of (2S,3R)-lactone(**1a**), the absolute configurations of gymnoprenols-A, -B, and gymnopilin should be revised as 2R,3S.



gymnoprenol A: R=H, m=5-6, n=2
gymnoprenol B: R=H, m=7-9, n=1
gymnopilin: R=



, m=5-6, n=2

References and Notes

1) S.Nozoe, Y.Koike and G.Kusano, Tetrahedron Lett., 25, 1371 (1984).
2) S.Nozoe, Y.Koike, E.Tsuji, G.Kusano and H.Seto, Tetrahedron Lett., 24, 1731 (1983).
3) S.Nozoe, Y.Koike, G.Kusano and H.Seto, Tetrahedron Lett., 24, 1735 (1983).
4) S.Nozoe, Y.Koike, N.Ito and G.Kusano, Chem. Lett., 1984, 1001.
5) R.M.Hanson, private communication. We are indebted to Dr. Robert M. Hanson of Massachusetts Institute of Technology for sending us a copy of his submitted paper concerning this revision.
6) G.Ohloff, W.Giersch, K.H.Schulte-Elte, P.Enggist and E.Demole, Helv. Chim. Acta, 63, 1582 (1980).
7) Conditions: column, Lichrosorb SI-60(4mmϕx250mm); eluent, $CHCl_3$ 1.0ml/min.
8) m/e: 245.1034 [$(M+1)^+$, Calcd. 245.1024, for $C_{11}H_{17}O_6$].
9) m/e: 245.1030 [$(M+1)^+$, Calcd. 245.1024, for $C_{11}H_{17}O_6$].
10) C.H.Behrens and K.B.Sharpless, Aldrichim. Acta, 16, 67 (1983).

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