CHEMISTRY LETTERS, pp. 13-14, 1982.

BITTER PRINCIPLES OF *VIBURNUM SUSPENSUM*

Tsunao HASE* and Tetsuo IWAGAWA
Department of Chemistry, Faculty of Science,
Kagoshima University, Kagoshima 890

Two bitter principles isolated from *Viburnum suspensum* have been determined to be a new iridoid glucoside(1) and its aglucone(2) by spectroscopic and chemical methods.

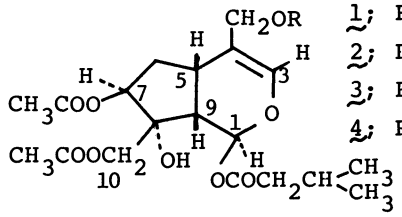
In the course of the investigation on bitter principles of *Viburnum* species, a new iridoid glucoside (named Suspensolide A)(1) and its aglucone(2) were isolated from the leaves of *Viburnum suspensum* L. by repeated chromatography of the methanolic extract together with p-hydroxycinnamic acid, scopolin, quercitrin, hyperin[1] and a non-bitter iridoid which was not investigated.

The spectral data of 1, $C_{25}H_{38}O_{14}$, $[\alpha]_D^{24}$ -42.9°(c 0.35, MeOH), a hygroscopic amorphous powder, are as follows: UV_{max}(MeOH) 204 nm (ε 18800); IR(Nujol) 3450 (OH), 1760 (ester C=O) and 1672 cm^{-1}(C=C); ^{1}H-NMR(CD_3COCD_3) δ 0.95 (6H, d, J=6 Hz, $\begin{matrix}CH_3\\CH_3\end{matrix}\!\!>$CH-), 1.98 (6H, s, CH_3CO), 2.40 (1H, dd, J=6 and 10 Hz, -CH-CH-CH-O-, H-9), 5.06 (1H, t, J=4 Hz, $-CH_2-\underline{C}H-O-$, H-7), 6.16 (1H, d, J=6 Hz, $-\underline{C}H-CH\begin{matrix}O-\\O-\end{matrix}$, H-1) and 6.44 (1H, brs, >C=CH-, H-3). Treatment of 1 with acetic anhydride in pyridine yielded hexaacetate(3) as colorless needles, mp 108-111°C, $C_{33}H_{46}O_{18}$, $[\alpha]_D^{24}$ -20°(c 0.50, MeOH), which showed a tertiary hydroxyl band at 3550 cm^{-1} in the IR spectrum. The NMR spectrum indicated the signals due to six acetoxyl groups at δ 2.08-2.12. Upon hydrolysis with hydrochloric acid, 1 afforded D-glucose, isovaleric acid and a black polymeric product.

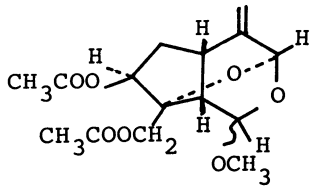
Enzymatic hydrolysis of 1 with β-glucosidase gave D-glucose and an amorphous aglucone 2, $C_{19}H_{28}O_9$, which was also isolated from the plant. In the NMR spectrum of 2, the signals of two methylene protons at δ 4.04, 4.13 (AB_q, J=12 Hz) and 4.25 (s), and one methine proton at 5.10 (t-like, J=5 Hz) were observed, besides those due to an acetal proton (6.33) and an olefinic proton (6.45, d, J=4 Hz). These data suggested that 2 has an iridoid structure, which was further supported by ^{13}C NMR data: CH_3 x 4: 20.7, 21.0, 22.3, 22.3; $-CH_2-$ x 4: 34.6,43.3, 62.2, 67.0; -CH- x 6: 25.6, 30.9, 44.8,

80.5, 89.5, 138.5; -C- x 2: 81.0, 117.4; -COO- x 3: 170.7, 171.2, 171.5 ppm.

Acetylation of 2 furnished a crystalline triacetate(4) mp 87°C, $C_{21}H_{30}O_{10}$. The signals of methylene protons (δ 4.04 and 4.13) of 2 shifted to δ 4.42 and 4.58 in the NMR spectrum of 4, and on irradiation at δ 4.50, the broad singlet at δ 6.55 assignable to C-3 proton appeared as a doublet (J=1.5 Hz) indicating that the glucosidic linkage is located at C-11 in 2.



1; R= β-D-Glc
2; R= H
3; R= β-D-Glc(Ac)$_4$
4; R= Ac



6

The coupling constants (4 Hz) between C-1 and C-9 protons of 1, 2, 3 and 4 in $CDCl_3$ are very similar to those reported for patrinoside and its derivatives,[2] and hence, support trans disposition of these protons. These assignments are cosistent with the (θ) value [-33500 (192 nm)] of 2.[3] The cis ring junction was suggested from the coupling constants (J=9 Hz) between C-5 and C-9 protons of 1, 2, 3 and 4.

Acid methanolysis of 3 afforded oily monoacetate(5), $C_{13}H_{18}O_6$, diacetate(6), $C_{15}H_{20}O_7$, which was also obtained by acetylation of 5, and methyl isovalerate. The NMR spectrum of 6 was identical with that of 4-acetoxy-3-acetoxymethyl-8-methoxy-10-methylene-2,9-dioxatricyclo(4,3,1,$0^{3,7}$)decane[4] which had been prepared from dihydrovaltrate. Therefore the isovaleryoxyl group in 2 (and 1) must be located at C-1, and the two acetoxyl groups at C-7 and C-10. The stereochemistry at C-7 and C-8 was assigned as shown.

Thus, the structures of suspensolide A and its aglucone can be represented by formulas 1 and 2.

References

1) T. Hase and M. Nakatani, Rep. Fac. Sci. Kagoshima Univ., 9, 59 (1976).

2) T. Endo and H. Taguchi, Chem. Pharm. Bull., 22, 1935 (1974).

3) L. F. Tietze, U. Niemeyer, P. Marx, K. H. Glusenkamp and L. Schwenen, Tetrahedron 36, 735 (1980).

4) P. W. Thies, Tetrahedron Lett., 35, 3087 (1970); The NMR spectrum of the authentic compound was kindly provided by Dr. P. W. Thies.

(Received September 12, 1981)