Phytochemistry, 1969, Vol. 8, pp. 2265 to 2267. Pergamon Press. Printed in England.

SHORT COMMUNICATION

THE PRESENCE OF TETRAHYMANOL IN *OLEANDRA WALLICHII**

J. M. ZANDER and E. CASPI

The Worcester Foundation for Experimental Biology, Inc., Shrewsbury, Massachusetts, 01545, U.S.A.

and

G. N. PANDEY and C. R. MITRA

Utilization Research Laboratories, National Botanical Gardens, Lucknow, India

(*Received* 13 *May* 1969)

Abstract—The identity of tetrahymanol, isolated from *Tetrahymena pyriformis*, and wallichiniol, isolated from *Oleandra wallichii*, is established. The presence in *O. wallichii* of a non-oxidative squalene cyclase system similar to that operating in *T. pyriformis* is suggested.

INTRODUCTION

THE ISOLATION of an unknown alcohol, wallichiniol, from the fern *Oleandra wallichii* (Polypodiaceae) has recently been reported.[1] We were impressed by the similarity between the physical and spectral properties of wallichiniol and its derivatives and those of tetrahymanol (Ia),[2] a triterpene alcohol isolated[3] from the protozoan *Tetrahymena pyriformis*. A direct comparison of tetrahymanol with a sample of wallichiniol supplied by the Lucknow Group was therefore made.

RESULTS AND DISCUSSION

Tetrahymanol and wallichiniol had identical mobilities on TLC in two solvents ((*a*) ethyl acetate/hexane (1:4), developed twice, R_f 0·44; (*b*) acetone/CH_2Cl_2 (1:19), R_f 0·37)) and separated without difficulty from epi-tetrahymanol (Id). Both alcohols were oxidized to the identical ketone Ic (R_f 0·78 in ethyl acetate/hexane (1:9)). The respective derivatives Ia, Ib and Ic obtained from the two sources had virtually identical m.ps. and mixed m.ps. and gave identical i.r. and mass spectra (Table 1). We therefore conclude that wallichiniol is tetrahymanol. Since the name tetrahymanol[3] was first introduced in 1963 we recommend its retention.

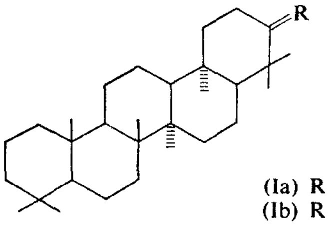
---

* This work was supported by grant P-500H from the American Cancer Society and grant K3-16614 from the U.S. Public Health Service.

[1] G. N. PANDEY and C. R. MITRA, *Phytochem.* **8**, 327 (1969).

[2] Y. TSUDA, A. MORIMOTO, T. SANO, Y. INUBISHI, F. B. MALLORY and J. T. GORDON, *Tetrahedron Letters* 1427 (1965).

[3] F. B. MALLORY, J. T. GORDON and R. L. CONNER, *J. Am. Chem. Soc.* **90**, 1362 (1963).



(Ia) R = α-OH, β-H
(Ib) R = α-OCOCH$_3$, β-H
(Ic) R = O
(Id) R = β-OH, α-H

Table 1. Comparison of physical and spectral characteristics of wallichiniol and tetrahymanol

Compound	M.p. (deg)	Mixed m.p. (deg)	R_f/solvent*	ν_{max}^{KBr} (cm^{-1})		Mass spectrum (m/e)
Wallichiniol	291–292	284–286	0·44/A 0·37/B	3450	Fingerprint region identical	428, 413, 410, 395, 207, 191
Tetrahymanol	287–289		0·44/A 0·37/B	3450		428, 413, 410, 395, 207, 191
Wallichiniol acetate	300	311–312	0·55/C	1730, 1250	Fingerprint region identical	470, 455, 410, 395, 191
Tetrahymanol acetate	311–312		0·55/C	1730, 1250		470, 455, 410, 395, 191
Wallichinione	290–291	290–291	0·78/C	1710	Fingerprint region identical	426, 411, 205, 191
Tetrahymanone	293–294		0·78/C	1710		426, 411, 205, 191

* Solvent A: Ethyl acetate/hexane (1:4). Solvent B: Acetone/methylene chloride (1:19). Solvent C: Ethyl acetate/hexane (1:9).

We have previously demonstrated[4] that the biosynthesis of tetrahymanol by *Tetrahymena pyriformis* proceeds via a non-oxidative cyclization of squalene. An analogous enzyme system is therefore probably operative in *Oleandra wallichii*, and it is noteworthy that the biosynthesis of fernene in the fern *Polypodium vulgare* apparently also shares a similar mechanism of formation.[5] It thus seems likely that the formation of 3-desoxytriterpenoids in nature involves a non-oxidative cyclization of squalene. Of additional interest is the observation that whilst in *T. pyriformis* the non-oxidative mechanism of squalene cyclization apparently[6] operates exclusively, both the oxidative *and* the non-oxidative pathways operate in ferns.

---

[4] (a) E. Caspi, J. M. Zander, J. B. Grieg, F. B. Mallory, R. L. Conner and J. R. Landrey, *J. Am. Chem. Soc.* **90**, 3563 (1968); (b) F. B. Mallory, R. L. Conner, J. R. Landrey, J. M. Zander, J. B. Greig and E. Caspi, *J. Am. Chem. Soc.* **90**, 3564 (1968); (c) E. Caspi, J. B. Greig and J. M. Zander, *Biochem. J.* **109**, 931 (1968); (d) E. Caspi, J. B. Greig and J. M. Zander, *J. Chem. Soc.* D 28 (1969); (e) J. M. Zander and E. Caspi, *J. Chem. Soc.* D 210 (1969).

[5] D. H. R. Barton, A. F. Gosden, G. Mellows and D. A. Widdowson, *J. Chem. Soc.* D 184 (1969).

[6] The presence of trace amounts of 3-oxygenated steroids in *T. pyriformis* has been claimed. For pertinent references, see M. S. Shorb, B. E. Dunlap and W. O. Pollard, *Proc. Soc. Exp. Biol. Med.* **118**, 1140 (1965).

EXPERIMENTAL

I.r. spectra were measured on KBr pellets in a Perkin–Elmer Model 237 spectrophotometer. Mass spectra were recorded on a Varian Model M-66 instrument at 70 eV. M.ps. were determined on a micro hot stage and are corrected.

Oxidation of Wallichiniol and Tetrahymanol

Each alcohol (4 mg) was dissolved in 3·5 ml of benzene/acetone (2:5) at 10° and 10 μl of Jones' reagent[7] was added with stirring. After 1 hr at this temperature the mixture was diluted with 10 ml of water and extracted with ether. The ether extract was washed with water, dried (Na_2SO_4) and evaporated. TLC of the product in ethyl acetate/hexane (1:9) followed by recrystallization from acetone gave 3 mg of ketone. The physical and spectral characteristics of this ketone are shown in the table.

[7] K. Bowden, I. M. Heilbron, E. R. H. Jones and B. C. L. Weedon, *J. Chem. Soc.* 39 (1946).