furnished a solid residue from which alkaloid **3** (8 mg), mp 224–225°, was obtained by prep. TLC on silica gel (butanone–xylene–Et_2NH–MeOH, 20:10:5:1) and repeated crystallization from EtOH. TLC (silica gel; solvent as above R_f 0.61) (Found C, 65.95, H, 6.50; N, 12.88. $C_{12}H_{14}N_2O_2$ requires: C, 66.02; H, 6.47; N, 12.84%).

Synthesis of (±)-1,2,3,9-*tetrahydro-5-methoxy-pyrrolo*[2,1-b]*quinazoline-3-ol.* 4-Amino-2-hydroxy-butyraldehyde diethylacetal (1.77 g) [7] was dissolved in H_2O (15 ml) and the pH of the soln adjusted to 2. The soln was then left at 80° for 30 min to liberate the free aldehyde (**6**). The pH of the soln of the aldehyde was adjusted to 5.5 with Pi buffer and the soln was added at 25° to a soln of 1.51 g 3-methoxyanthranilaldehyde (**5**) [8] in 50% (v/v) aq. MeOH (50 ml). The pH of the mixture was adjusted to 5.8 with Pi buffer and the mixture left at 25° for 3 days to give an orange soln of compound **7**. The orange soln was then stirred vigorously at 60° in an atm of H_2 in the presence of 5% Pd–$BaSO_4$ catalyst for 1 hr. The mixture was filtered and the filtrate basified with NaOH and extracted with $CHCl_3$. The $CHCl_3$ extract was dried (Na_2SO_4) and the solvent evapd, when a light brown solid (1.2 g), mp 212–215°, was obtained. The solid after three crystallizations from EtOH gave racemic **3** as colourless crystals (0.9 g), mp 224–225°. (Found C, 65.93; H, 6.52; N, 12.90. $C_{12}H_{14}N_2O_2$ requires: C, 66.02; H, 6.47; N, 12.84%.) Synthetic **3** was identical with the natural product (mp, mmp, TLC, IR, NMR).

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CYCLOBUXOVIRICINE, A STEROIDAL ALKALOID FROM *BUXUS PAPILOSA*

ATTA-UR-RAHMAN, M. IQBAL CHOUDHARY and (in part) MEHRUN NISA

H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-32, Pakistan

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Key Word Index—*Buxus papilosa*; Buxaceae; leaves; steroidal alkaloid; cyclobuxoviricine; ^{13}C NMR.

Abstract—A new steroidal alkaloid has been isolated from the leaves of *Buxus papilosa*. Its structure has been assigned as **1** on the basis of spectroscopic studies.

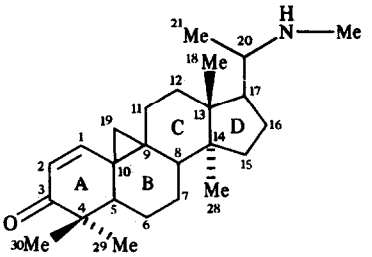
INTRODUCTION

Buxus papilosa C. K. Schn, L. (Buxaceae) occurs abundantly in the northern regions of Pakistan. We have previously reported a number of new alkaloids from this plant [1, 2]. We now report the isolation and structural elucidation of a new steroidal alkaloid cyclobuxoviricine (**1**).

RESULTS AND DISCUSSION

Cyclobuxoviricine was isolated from the leaves of *B. papilosa* by extraction with ethanol, fractionation on the basis of differential basicity, CC and prep. TLC. Its IR spectrum showed bands at 1595 (C=C), 1647 (C=C–C=O) [3] and 3350 cm^{-1} (NH). The UV spectrum was identical to that encountered in cyclobuxoviridine [4], showing maxima at 203 and 268 nm and a minimum at 230 nm.

The ^1H NMR spectrum ($CDCl_3$, 300 MHz) showed four singlets at δ0.95, 0.90, 0.97 and 1.09, corresponding to the four tertiary methyl groups C-18, 28, 29, and 30, respectively. The secondary C-21 methyl group resonated as a doublet at δ1.18 ($J_{21,20}$ = 6.0 Hz), while the neighbouring C-20 methine proton appeared as a multiplet at δ2.78 ($J_{20,21}$ = 6 Hz, $J_{20,17}$ = 9.8 Hz). Irradiation at δ2.78 resulted in the collapse of the doublet of C-21 protons at δ1.18 into a sharp singlet. A three-proton singlet resonated at δ2.48, which was assigned to the –NMe group. A set of AB double doublets resonating at



1

δ0.75 and 0.81 ($J_{19\alpha, 19\beta}$ = 5.0 Hz) was assigned to the cyclopropyl methylene protons. The downfield shift from the usual values [5] is due to the deshielding effect of the neighbouring olefinic functionality and has been observed earlier [3]. Two doublets at δ6.76 and 5.94 were ascribed to the C-1 and C-2 olefinic protons, respectively ($J_{1,2}$ = 10.1 Hz).

The ^{13}C NMR spectrum in $CDCl_3$ showed four signals at δ16.5, 17.15, 21.5, and 23.4 which were assigned to C-18, C-28, C-30 and C-29 methyl carbons, respectively. The C-2 olefinic carbon appeared at δ127.08, while the C-1 olefinic carbon β to the ketonic function resonated at δ153.18. The assignments to the various carbon atoms are shown in Table 1.

The mass spectrum of the compound afforded an $[M]^+$ at *m/z* 369.3025 which corresponds to the formula $C_{25}H_{39}NO$ (calc. 369.3031) indicating seven double bond equivalents. A peak at *m/z* 354.2759 ($C_{24}H_{36}NO$, calc. 354.2796) resulted from the loss of a methyl group from the $[M]^+$. Another peak at *m/z* 339.2551 was present corresponding to the loss of –NHMe from the $[M]^+$, and this ion is commonly found in *Buxus* alkaloids bearing an Me–CHNHMe side chain at C-17 [6]. A peak at *m/z* 312.2407 ($C_{22}H_{32}O$, calc. 312.2453) was consistent with the loss of $C_3H_7N^+$ from the $[M]^+$. The ion at *m/z* 85.0873 was in accordance with the composition $C_5H_{11}N$ (calc. 85.0891) which was attributed to cleavage of ring D [2]. The substance showed a base peak at *m/z* 57.0577 corresponding to $C_3H_7N^+$, which corresponds to the loss of Me–C=NH–Me [1]. On the basis of these studies structure **1** is assigned to cyclobuxoviricine.

Table 1. ^{13}C NMR spectral data of cyclobuxoviricine*

Carbon	Chemical shift (ppm)
1	153.18
2	127.08
3	199.20
4	45.53
5	49.20†
6	24.42
7	27.59
8	44.61
9	19.14‡
10	40.17
11	26.98
12	34.57
13	43.45
14	49.34†
15	31.94
16	29.02
17	49.99
18	16.50
19	19.50‡
20	58.57
21	18.60
28	17.15
29	23.40
30	21.50
NMe	29.90

*Recorded in $CDCl_3$ at 75 MHz.

†,‡These values are interchangeable.

EXPERIMENTAL

MS were recorded on a double focussing spectrometer connected to a computer system. ^{1}H NMR spectra were recorded in $CDCl_3$ at 300 MHz, while ^{13}C NMR spectra were recorded at 75 MHz. The purity of the sample was checked on TLC (silica gel, Si F, precoated plates).

An EtOH extract of *B. papilosa* leaves (50 kg) collected from the northern regions of Pakistan, was evapd to a gum. Total alkaloids were obtained by extraction into 10% HOAc. Partial separation of alkaloids was carried out by extraction into $CHCl_3$ at different pH values. The fraction obtained at pH 3.5 was loaded on a silica column (0.2–0.5 mm, 35–70 mesh ASTM). Elution with $CHCl_3$–MeOH (9:1) afforded a number of close-moving alkaloids. The mixture was subjected to prep. TLC (silica gel) employing hexane–Me_2CO–Et_2NH (8:1.5:0.5), to afford cyclobuxoviricine (17.5 mg) as a white amorphous solid, $[\alpha]_D^{10}$ = −54° ($CHCl_3$). UV λ_{max}^{MeOH} nm: 203, 268, λ_{min} 230; IR $\nu_{max}^{CHCl_3}$ cm^{-1}: 1595 (C=C), 1647 (C=C–C=O), 3350 (NH); ^{1}H NMR (300 MHz, $CDCl_3$): δ0.75 and 0.81 (2H, *dd*, $J_{19\alpha, 19\beta}$ = 5.1 Hz, C-19 CH_2), 0.90 (3H, *s*, 19-Me), 0.95 (3H, *s*, 18-Me), 0.97 (3H, *s*, 29-Me), 1.09 (3H, *s*, 30-Me), 2.48 (3H, *s*, NMe), 2.78 (1H, *m*, $J_{20,21}$ = 6.0 Hz, $J_{20,17}$ = 9.8 Hz, H-20), 5.94 (1H, *d*, $J_{2,1}$ = 10.1 Hz, H-2), 6.76 (1H, *d*, $J_{2,1}$ = 10.1 Hz, H-1); MS *m/z* (rel. int.): 369.3025 (72), 354.2759 (22), 339.2551 (14), 312.2407 (12), 85.0873 (61), 57.0577 (100).

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