spectrum and EIMS identical with **1**. FAB-MS *m/z* (rel. int.): 517 $[M+K]^+$ (8.1), 479 $[M+H]^+$ (10.5), 441 $[M-K+2H]^+$ (54), 361 $[Aglyc+H]^+$ (21), 167 $[A_1-Me]^+$ (11.8), 165 $[B_2]^+$ (8), 151 $[B_2-Me+H]^+$ (8.4).

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A FURTHER QUINAZOLINE ALKALOID FROM *ADHATODA VASICA**

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Key Word Index—*Adhatoda vasica*; Acanthaceae; quinazoline alkaloid; 1,2,3,9-tetrahydro-5-methoxypyrrolo[2,1-*b*]quinazoline-3-ol.

Abstract—A new quinazoline alkaloid isolated from the leaves of *Adhatoda vasica* has been identified as 1,2,3,9-tetrahydro-5-methoxypyrrolo[2,1-*b*]quinazoline-3-ol.

INTRODUCTION

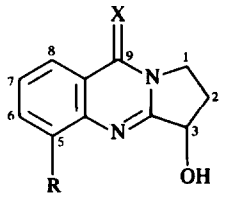
Adhatoda vasica (Acanthaceae) is known to furnish quinazoline alkaloids [1]. Vasicine (**1**) and vasicinone (**2**), the two alkaloids of the plant are remarkable in bioactivity [2–5]. In the course of our investigations on the biologically active compounds related to vasicine and vasicinone, we undertook further chemical examination of the leaves of the plant. The present investigation revealed the presence of the quinazoline alkaloid (**3**) which hitherto has not been reported as a constituent of any natural material.

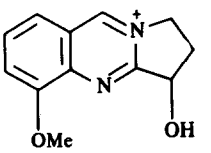
*Part 2 in the series "Vasicine and Related Compounds". For Part 1 see Chowdhury, B. K., Afolabi, E. O., Sokomba, E. N. and Osuide, G. (1985) *Indian J. Chem.* (in press).

RESULTS AND DISCUSSION

The alkaloid **3**, $C_{12}H_{14}N_2O_2$ ($[M]^+$ *m/z* 218), mp 224–225° was optically inactive and was found to be homogeneous by TLC and mass spectrometry. The UV spectrum of the alkaloid showed a maximum at 307 (log ε3.85) nm. The IR spectrum (KBr) showed absorption bands at 3470 (OH), 1630 (>C=N–), 1605, 1500 (aromatic residue), 1250 (aromatic ether) and 845 cm^{-1} (substituted benzene derivative). The ^1H NMR spectrum showed signals at δ6.60–7.0 (*m*, 3H, aromatic protons), 4.71 (*t*, 1H, C-3), 4.50 (*s*, 2H, C-9), 3.80 (*s*, 3H, aromatic methoxyl), 3.21 (*m*, 2H, C-1) and 2.18 (*m*, 2H, C-2). The mass spectrum of **3** showed an $[M]^+$ at *m/z* 218, the base peak appearing at *m/z* 217 $[M-1]^+$ due to the formation of the quinazolinium ion (**4**). The mass spectrum also revealed ions at *m/z* 203 $[M-15]^+$ and 199 $[M-1-18]^+$ which supported the presence of methoxyl and hydroxyl groups.

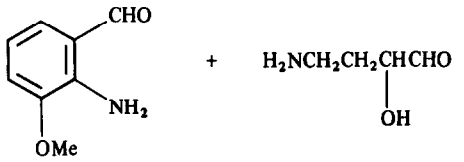
All these data and a direct comparison of the ^1H NMR



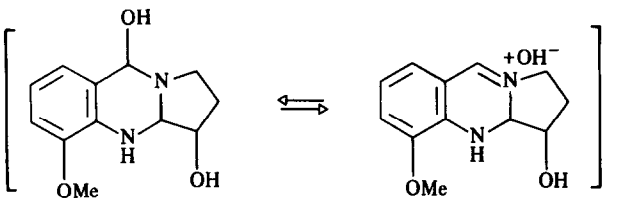


1 R = H, X = H_2
2 R = H, X = O
3 R = OMe, X = H_2

4



5 **6**



7

3

Scheme 1.

spectrum of **3** with that of DL-vasicine (**1**) show that the alkaloid **3** is a derivative of vasicine (**1**) having a methoxyl group in the benzene ring. From biogenetic considerations, a highly probable position of the methoxyl group is C-5. There is one report [6] of the synthesis of this methoxy analogue of vasicine which is described in the literature as DL-4-methoxyvasicine (**3**). Since the mp of synthetic **3** is very close to the isolated alkaloid, we synthesized **3** using a method different from that reported earlier [6]. The synthesis (Scheme 1) was carried out using the Schof–Oechler scheme which was successfully utilized by Leonard and Martell [7] for the synthesis of vasicine.

The synthetic quinazoline derivative, (±)-1,2,3,9-tetrahydro-5-methoxy-pyrrolo[2,1-*b*]-quinazoline-3-ol (**3**) was found to be identical with the isolated alkaloid in all respects. From all these data, the new alkaloid of *Adhatoda vasica* has been assigned structure **3**.

EXPERIMENTAL

Mps are uncorr. UV spectra were recorded in MeOH, IR spectra in KBr and ^{1}H NMR spectra in $CDCl_3$ (60 MHz) with TMS as int. standard.

Isolation of alkaloid **3**. Air dried finely powdered leaves (1 kg) of *A. vasica* Nees were exhaustively extracted with EtOH, the extract concd and shaken with 15% aq. HOAc. The acid soln was first extracted with Et_2O to remove non alkaloidal matter and then made alkaline with NH_4OH. The alkaline soln was extracted with Et_2O. The residue from the Et_2O extract was taken up in 15% aq. HOAc, the acid soln made alkaline with NH_4OH and then extracted with Et_2O. The Et_2O extract yielded DL-vasicine, mp 211–212°. The extract, after separation of vasicine, was chromatographed over basic alumina. The column was eluted with petrol, C_6H_6, C_6H_6–$CHCl_3$ (1:1), $CHCl_3$ and $CHCl_3$–MeOH (99:1). The $CHCl_3$–MeOH fraction

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*

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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