

**The Isolation and Structure of
Hyderabadine, a New Indole Alkaloid from
*Ervatamia coronaria***

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Z. Naturforsch. **38b**, 1310-1312 (1983);
received April 27, 1983

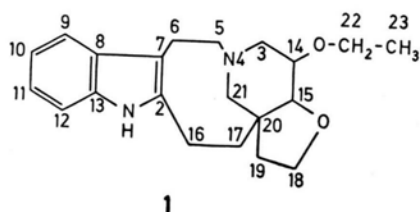
Indole Alkaloid, *Ervatamia coronaria*

A new indole alkaloid, hyderabadine, has been isolated from the leaves of *Ervatamia coronaria* to which structure **1** has been assigned.

Ervatamia coronaria (Apocynaceae) is a glabrous, evergreen tree commonly grown in the gardens of West Pakistan. Various parts of the plant are used in the indigenous system of medicine for the treatment of ophthalmia, for application on wounds and inflamed parts of the body, as anthelmintic etc. A number of indole alkaloids have previously been reported from the leaves, stem bark and roots of the plant [1-8].

The crude alkaloids obtained from the ethanolic extract of the fresh leaves of the plant were subjected to careful column chromatography on silica gel. Elution was carried out with increasing polarities of petroleum-ether (40-60), chloroform and methanol. The fraction obtained on elution with chloroform and 95% chloroform-methanol afforded a mixture of alkaloids which were further purified by preparative t.l.c. to afford a new alkaloid, "Hyderabadine" as a whitish amorphous material.

The compound afforded typically indolic UV spectrum showing absorption maxima at 284 nm and 229 nm and minimum at 250 nm. The IR spectrum (chloroform), afforded peaks at 3300, (indole N-H), 2920, 2850 (C-H) cm^{-1} , but did not show any peaks in the carbonyl region.



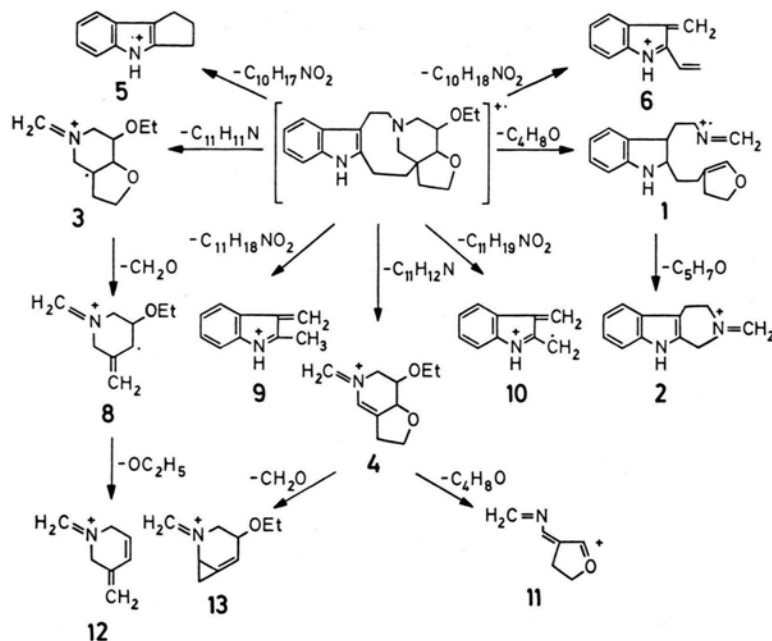
A detailed mass spectroscopic analysis of hyderabadine was carried out. The molecular ion appeared at $m/e = 340.2152$ which was consistent with the formula $\text{C}_{21}\text{H}_{28}\text{N}_2\text{O}_2$ indicating nine double

bond equivalents. Since six of these were accounted for by the presence of an indolic chromophore and since the IR, H NMR, and C-13 NMR did not show the presence of any additional olefinic linkages or any carbonyl group, it seemed plausible that hyderabadine had a pentacyclic structure. Attempted reduction with sodium borohydride or LAH failed to afford any reduction products. Hyderabadine showed the following major peaks in its mass spectrum: 340.2152 (M^+ , $\text{C}_{21}\text{H}_{28}\text{N}_2\text{O}_2$, 86%), 311.1760 ($\text{M}^+ - \text{Et}$, $\text{C}_{19}\text{H}_{23}\text{N}_2\text{O}_2$, 75%), 295.1801 ($\text{M}^+ - \text{OEt}$, $\text{C}_{19}\text{H}_{23}\text{N}_2\text{O}$, 18%), 268.1549 ($\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}$, 10%), 265.1361 ($\text{C}_{17}\text{H}_{17}\text{N}_2\text{O}$, 11%), 225.1028 ($\text{C}_{14}\text{H}_{13}\text{N}_2\text{O}$, 24%), 185.1081 ($\text{C}_{12}\text{H}_{13}\text{N}_2$, 48%), 183.1261 ($\text{C}_{10}\text{H}_{17}\text{NO}_2$, 15%), 182.1178 ($\text{C}_{10}\text{H}_{16}\text{NO}_2$, 19%), 157.0875 ($\text{C}_{11}\text{H}_{11}\text{N}$, 35%), 156.0807 ($\text{C}_{11}\text{H}_{10}\text{N}$,

Table I. m/z , Intensity, formulae and structure of fragment ions.

m/z	Inten- sity	Formulae	Proposed structure
I	268.1549 (10%)	$\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}$	
II	185.1081 (48%)	$\text{C}_{12}\text{H}_{13}\text{N}_2$	
III	183.1261 (15%)	$\text{C}_{10}\text{H}_{17}\text{NO}_2$	
IV	182.1178 (19%)	$\text{C}_{10}\text{H}_{16}\text{NO}_2$	
V	157.0875 (35%)	$\text{C}_{11}\text{H}_{11}\text{N}$	
VI	156.0807 (100%)	$\text{C}_{11}\text{H}_{10}\text{N}$	
VII	153.1147 (15%)	$\text{C}_9\text{H}_{15}\text{NO}$	
VIII	152.1097 (30%)	$\text{C}_9\text{H}_{14}\text{NO}$	
IX	144.0800 (77%)	$\text{C}_{10}\text{H}_{10}\text{N}$	
X	143.0729 (83%)	$\text{C}_{10}\text{H}_9\text{N}$	
XI	110.0611 (36%)	$\text{C}_6\text{H}_8\text{NO}$	
XII	108.0808 (77%)	$\text{C}_7\text{H}_{10}\text{N}$	

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0340-5087/83/1000-1310/\$ 01.00/0



SCHEME - I

100%), 152.1097 ($C_9H_{14}NO$, 30%), 144.0800 ($C_{10}H_{10}N$, 77%), 143.0729 ($C_{10}H_9N$, 83%), 110.0611 (C_6H_8NO , 36%) and 108.0808 ($C_7H_{10}N$, 77%). The formulae of the ions were established by computer monitored high resolution mass measurements and confirmed by peak matching experiments on important ions. As a result of these studies, the structures of some of the fragment ions have been identified. The exact masses of ions, intensities, formulae and proposed structures are shown in Table I. Plausible mechanisms for the formation of these ions are presented in Scheme I. Linked scan measurements were carried out to confirm some of the key fragmentation processes. The formation of ions II, V, VI, VIII, IX, X and XII finds support from a corresponding fragmentation observed in quebrachamine [9]. More interesting were the ions I, III, IV and XI which have also been encountered in beninine [10] and appear to arise in hyderabadine by similar fragmentation processes. The proton NMR spectrum ($CDCl_3$) showed the presence of a triplet centered at δ 1.21 ($J = 7$ Hz) and a quartet centered at δ 3.39 ($J = 7$ Hz) which were assigned to the methyl and methylene protons of an ethoxy group. A downfield doublet centred at δ 4.52 ($J = 7$ Hz) was assigned to the C-15 proton. A complex multiplet in the region δ 3.73–3.93 was ascribed to the oxymethylene protons at C-18. A broad peak at δ 8.25 was assigned to the N–H group.

The C-13 NMR of hyderabadine ($CDCl_3$) provided further support for the proposed structure I. A comparison with the C-13 NMR of quebrachamine

[11] showed that C-3 resonated at δ 58.94 instead of δ 55.1 found in quebrachamine. This was consistent with a larger downfield shift (6–7 ppm) caused by the ethoxy group at the adjacent carbon atom being partly compensated by an upfield shift (2–3 ppm) caused by the ether linkage at C-15 [12]. Similarly C-20 was found to resonate at δ 40.34 (δ 37.1 in quebrachamine) which could be rationalised in terms of a larger downfield shift caused by the ether linkage at C-15 being partly compensated by a smaller upfield shift due to the ethoxy group at C-14. Carbon 21 was found to resonate at δ 54.29 (δ 56.8 in quebrachamine) and the upfield shift caused by the β -ethereal linkage could again be recognised here. The assignments to various carbon are shown in Table II.

Table II. ^{13}C NMR of hyderabadine.

Carbon No.	Chemical shift (δ)	Carbon No.	Chemical shift (δ)
2	139.64	14	72.08
3	58.94	15	80.88
5	51.92	16	21.79
6	29.68	17	30.92
7	108.16	18	72.95
8	128.49	19	36.43
9	117.45	20	40.34
10	118.69	21	54.29
11	120.92	22	65.12
12	110.78	23	15.39
13	134.9		

In consideration of the data presented above, structure **1** is proposed for hyderabadine. It may arise in the plant from a derivative of voaphylline bearing a hydroxyl group at C-18 which by an

intramolecular cyclisation etc. could afford hyderabadine. The presence of hecubine and voaphylline in *Ervatamia coronaria* [7] lends support to this suggestion.

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