

The Isolation and Structure of Mehranine, a New Indoline Alkaloid from *Ervatamia coronaria*

Atta-ur-Rahman*, Anjum Muzaffar, and Nader Daulatabadi

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

Z. Naturforsch. **38b**, 1700-1701 (1983); received June 13, 1983

Indoline Alkaloids, *Ervatamia coronaria*, Mass Spectrum, NMR Spectrum, Medicinal Plants

A new indoline alkaloid, mehranine, 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 fresh leaves of the plant were fractionated at different pH values. The fraction obtained by extraction with chloroform at pH-3 afforded a mixture of alkaloids which were further purified by preparative t.l.c. to afford a new alkaloid, mehranine, as a colourless amorphous material, (α)_D = +36° (CHCl₃).

The compound afforded a typical dihydroindole UV spectrum showing absorption maxima at 209 nm (log ϵ 4.03), 257 nm (log ϵ 3.85) and 305 nm (log ϵ 3.47) and minima at 230 nm (log ϵ 3.23) and 279 nm (log ϵ 3.41).

The IR spectrum (chloroform), afforded peaks at 2920 (C-H), 2800 (N-CH₃), 1605, 1480, 1380, 1250 (C-O-C of epoxide), 1140, 900, 860 and 740 cm⁻¹, but did not show any peaks in the carbonyl and hydroxyl regions.

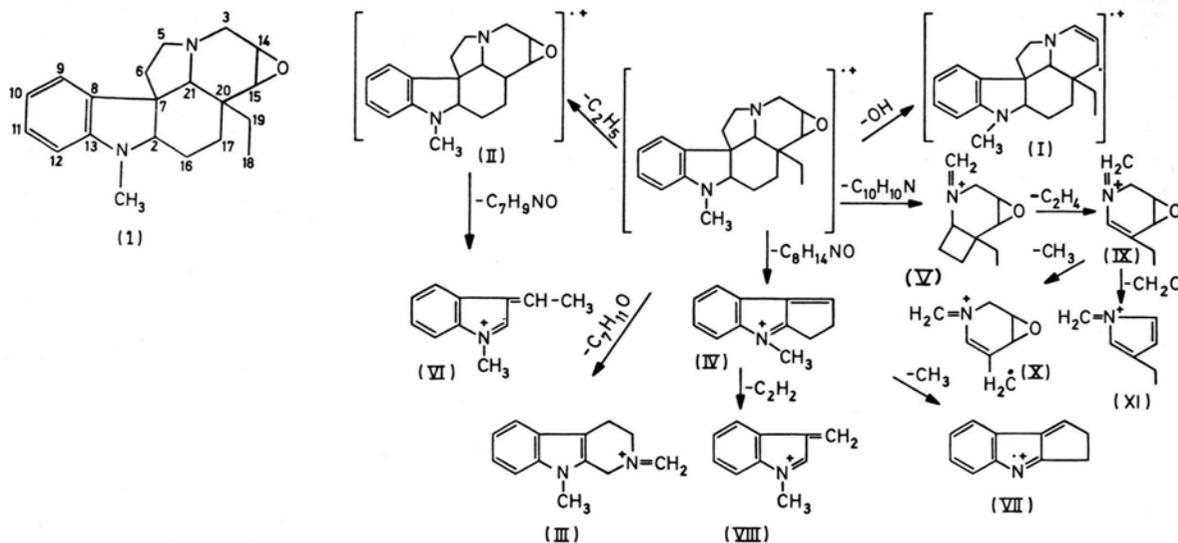
A detailed mass spectroscopic analysis of mehranine was carried out. The molecular ion appeared at m/z = 310.2056 which was consistent with the formula C₂₀H₂₆N₂O, indicating nine double bond equivalents. Since five of these were accounted for by the presence of an indoline chromophore, the IR and H NMR did not show the presence of any additional olefinic linkages or carbonyl groups, and since attempted acetylation failed to afford any acetylated product, it seemed plausible that the

oxygen atom is in the form of an epoxide or ether linkage. Mehranine showed the following major peaks in its mass spectrum: 310.2056 (M⁺, C₂₀H₂₆N₂O, 100%), 293.2046 (M⁺-OH, C₂₀H₂₅N₂, 4%), 281.1640 (M⁺-C₂H₅, C₁₈H₂₁N₂O, 7%), 199.1227 (C₁₃H₁₅N₂, 27%), 170.0942 (C₁₂H₁₂N, 17%), 166.1232 (C₁₀H₁₆NO, 34%), 158.0962 (C₁₁H₁₂N, 71%), 155.0760 (C₁₁H₉N, 10%), 144.0809 (C₁₀H₁₀N, 90%), 138.0919 (C₈H₁₂NO, 47%), 123.0625 (C₇H₉NO, 23%) and 108.0813 (C₇H₁₀N, 47%). The formulae of the ions were established by computer monitored high resolution mass measurements and confirmed by peak matching experiments on important ions. The fragment ions may be considered in two groups, (a) those bearing the indolenine moiety and (b) those bearing the oxygenated piperidine moiety. The exact masses of ions, intensities, formulae and proposed structures are shown in Table I. Linked scan measurements were carried out to confirm the key fragmentation processes. Plausible mechanisms

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

m/z	Intensity	Formulae	Proposed structure
a) Some indole/indoleninium bearing ions			
III) 199.1227	(27%)	C ₁₃ H ₁₅ N ₂	
IV) 170.0942	(17%)	C ₁₂ H ₁₂ N	
VI) 158.0962	(71%)	C ₁₁ H ₁₂ N	
VII) 155.076	(10%)	C ₁₁ H ₉ N	
VIII) 144.0809	(90%)	C ₁₀ H ₁₀ N	
b) Ions from piperidine moiety			
V) 166.1232	(34%)	C ₁₀ H ₁₆ NO	
IX) 138.0919	(47%)	C ₈ H ₁₂ NO	
X) 123.0625	(23%)	C ₇ H ₉ NO	
XI) 108.0813	(47%)	C ₇ H ₁₀ N	

* Reprint requests to Prof. Dr. Atta-ur-Rahman. 0340-5087/83/1200-1700/\$ 01.00/0



Scheme I

for the formation of these ions are presented in Scheme I. The presence of the ethyl and epoxide groups is indicated by ions II and I which are attributed to losses of ethyl and hydroxyl radicals respectively. The ions V, IX and X contain the oxygenated piperidine portion of the molecule. The formation of ion V and IX finds analogy in a corresponding fragmentation observed in deacetyl-aspidospermine [9]. The mass spectrum strongly indicated that the substance in hand had an Aspidosperma skeleton, with the oxygen being present, probably as an epoxide, in the piperidine ring.

The proton NMR spectrum (CDCl_3) showed the presence of a triplet centered at δ 0.81 ($J = 7$ Hz) and a quartet centered at δ 1.27 ($J = 7$ Hz) which are assigned to the methyl and methylene protons respectively of the ethyl group. These assignments were confirmed by double resonance experiments.

A three proton singlet at δ 2.75 was assigned to the N- CH_3 group. The C-15 proton resonated as a doublet centered at δ 2.96 ($J = 4.1$ Hz). A doublet triplet centered at δ 3.36 ($J_1 = 4.1$ Hz, $J_2 = 5.6$ Hz, $J_3 = 5.6$ Hz) was assigned to the C-14 proton. These assignments were further supported by the fact that irradiation at δ 2.96 caused the double triplet at δ 3.36 to collapse into a triplet. A double-doublet centered at δ 3.58 ($J_1 = 6$ Hz, $J_2 = 12$ Hz) was assigned to the C-2 proton. A complex multiplet in the region δ 2.37–2.52 was attributed to the C-16 proton while a singlet at δ 2.25 was assigned to the C-21 proton. Irradiation at δ 2.25 caused no change in the NMR spectrum. The aromatic protons resonated as complex multiplets in the region δ 7.0–7.5.

On the basis of the above spectral data as well as biosynthetic reasoning (*cf.* hecubine [7], voaphylline [7], lochnericine [10], indoline moiety in ervafoleline [11]) structure 1 has been assigned to mehranine.

- [1] A. N. Ratnagiriswaran and K. Venkatachalam, *Quart. J. Pharm. Pharmacol.* **12**, 174 (1939).
- [2] S. A. Warsi and B. Ahmad, *Pakistan J. Sci.* **1**, 128 (1949).
- [3] M. Gorman, N. Neuss, N. J. Cone, and J. A. Deyrup, *J. Am. Chem. Soc.* **82**, 1142 (1960).
- [4] T. Dutta, *J. Inst. Chem. (India)* **41**(1), 5 (1969).
- [5] B. Talapatra, A. Patra, and K. S. Talapatra, *Phytochem.* **14**(7), 1652 (1975).
- [6] G. D. Monache, I. L. D'Albuquerque, F. D. Monache, M. Betolo, and G. Battista, *Atti. Acad. Naz. Lincei cl. Sci. Fis. Mat. Natur. Rend.* **52**(3), 375 (1972).
- [7] C. Gomez Gonzalez and J. Martinez, *Rev. Cubana Farm.* **10**(1), 45 (1976).
- [8] P. G. Rao and B. P. Singri, *Indian J. Chem. Sect. B* **17 B** (4), 414 (1979).
- [9] H. Budzikiewicz, C. Djerassi, and D. H. Williams, *Structure elucidation of natural products by mass spectrometry*, Vol. I, Holden Day, San Francisco 1964.
- [10] K. Raj, A. Shoeb, S. R. Kapil, and P. S. Popli, *Phytochem.* **13**(8), 1621 (1974).
- [11] P. Lathuilliere, L. Olivier, J. Levy, and J. LeMen, *Ann. Pharm. Fr.* **28**(1), 57 (1970).