RAUCUBAINE, A NEW TYPE OF INDOLE ALKALOID FROM RAUWOLFIA SALICIFOLIA GRISEB.

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Abstract - Raucubaine (2), a new indole alkaloid with a novel carbon skeleton was isolated from the leaves of Rauwolfia salicifolia griseb. The structure was determined by X-ray diffraction analysis.

Rauwolfia salicifolia griseb., a species endemic to Cuba, was collected in Baracoa, a zone in Guantánamo province. The leaves of the plant yielded a new alkaloid raucubaine, $C_{20}H_{24}N_2O_3$. Raucubaine, crystallised from methanol, had mp. 224°C, $[\alpha]_D^{20}$ - 18° ($CHCl_3$), and gave a UV spectrum characteristic of the dihydroindole chromophore with maxima at 209, 249 and 290 nm. $\Delta\varepsilon$ values measured from the CD spectrum were -10.12 (204 nm), +15.83 (246) and -1.45 (295). The IR spectrum showed absorbances at 3450 (OH), 2975 (NCH_3) and 1768 (γ-lactone) cm^{-1}. The ^{1}H-nmr spectrum showed prominent absorbances for: four aromatic protons (δ 6.4 - 7.4), an N-methyl group (δ 2.72), a methyl group (δ 1.29, d, J = 7 Hz) and a methine signal at δ 3.65 (q, J = 7 Hz). The alkaloid was further characterised by its mass spectrum with significant ions at m/e 340 (M^+), 213, 196, 158, 157 and 144. These fragments, viz. a - f (Figure 1) are characteristic of the pattern derived from members of the Strychnos family[1] (eg. akuammicine) and on this basis raucubaine was originally assigned the structure 1, consistent with the above-mentioned spectral data. Meanwhile the compound was subjected to X-ray diffraction analysis. The crystals of the alkaloid were monoclinic, $P2_1$, a = 7.2179 (3), b = 12.8169 (7), c = 9.1996 (2) Å, β= 93.040 (3), Z = 2. X-ray intensity data was collected on an automatic Enraf-Nonius CAD-4 diffractometer with an $\omega - 2\theta$ scan. 1700 of the 1822 reflections (93.3%) measured in the range $2° < \theta < 75°$ had $I / \sigma(I) > 3$ and were considered observed and included in the refinement. The structure was solved by direct methods[2]; the E-map revealed the position of all non-hydrogen atoms. After four full-matrix least squares refinement cycles all hydrogen atoms were located on a difference map.

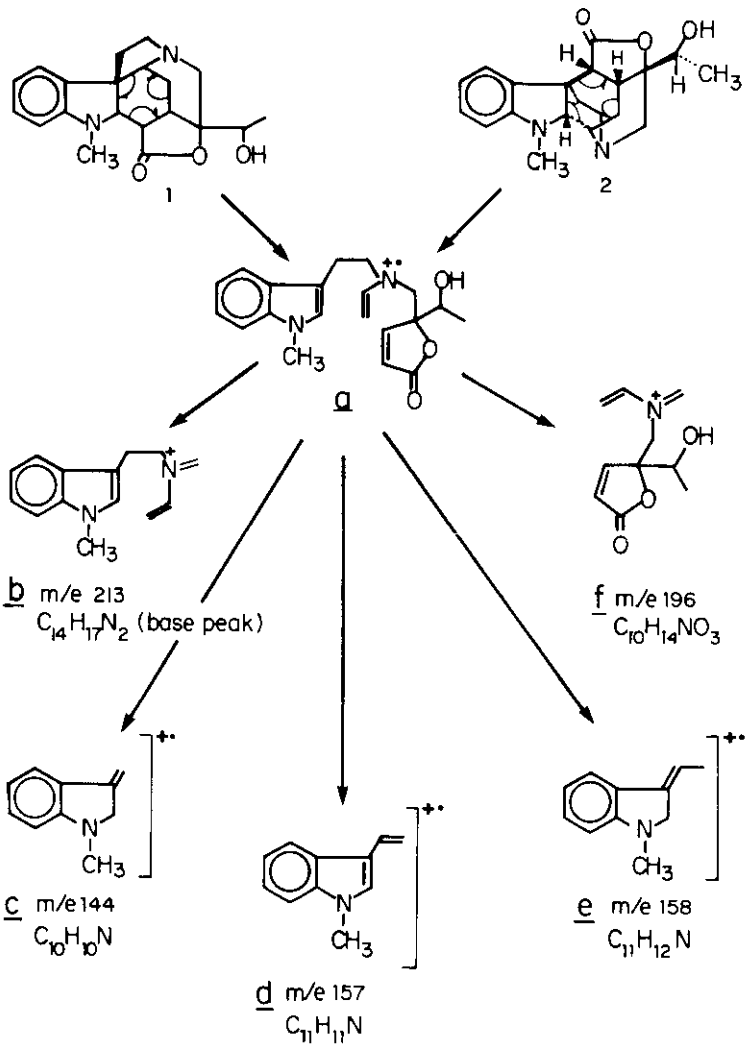
1
2
a
b m/e 213
C14H17N2 (base peak)
c m/e 144
C10H10N
d m/e 157
C11H11N
e m/e 158
C11H12N
f m/e 196
C10H14NO3

Figure 1

An isotropic extinction correction was applied and the structure refined with a polynomial weighting scheme to a final R of 0.046. Figure 2 shows a view of the molecule. The molecules were connected by O-H ··· N hydrogen bonds.

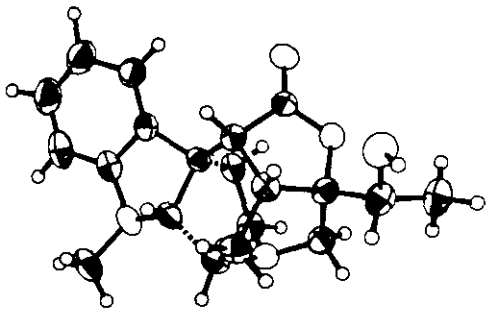

Figure 2

The structure 2, determined for raucubaine by X-ray analysis, can be seen consistent with the mass spectral data when ring C is cleaved, as shown, to give the primary fragment a (Figure 1). The interesting biosynthetic aspects of a structure such as 2 will be discussed at a later date, together with the structures of several other compounds closely related to raucubaine.

Acknowledgements: Financial aid from the Natural Sciences and Engineering Research Council Canada and Canadian University Service Overseas is gratefully acknowledged. We also thank Dr. Dolejs, Dr. K. Blaha and Ing. Samek, Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Science, Prague, for various spectra and discussions with one of us (P.S.).

References

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Received, 2nd July, 1980