Phytochemistry, 1972, Vol. 11, pp. 1531 to 1532. Pergamon Press. Printed in England.

NEUTRAL COMPOUNDS AND ALKALOIDS OF *ZANTHOXYLUM OCUMARENSE**

D. DELLA CASA DE MARCANO, M. HASEGAWA and A. CASTALDI
Escuela de Química, Facultad de Ciencias, Universidad Central de Venezuela, Caracas, Venezuela

(*Received* 28 *September* 1971)

The genus *Zanthoxylum* consists of more than eighty plant species, found principally in Africa, America and Australia. Many natural products, such as alkaloids, terpenes, glycosides and pigments have been isolated from them.

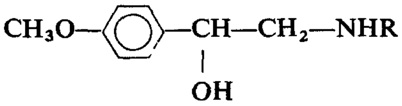
Benzene extraction of the bark of *Z. ocumarense*, collected near the coast of Venezuela (Henry Pittier National Park), followed by alumina chromatography, yielded the following compounds, in order of increasing polarity.

(i) A mixture of crystalline hydrocarbons, shown to be *n*-alkanes of formula $C_{21}H_{44}$ to $C_{33}H_{68}$ by comparison with standard samples using GLC, and mass spectral analysis according to the method of O'Neal.[1]

(ii) A triterpenoid mixture, the major component of which, lupeol, was identified after hydrogenation and separation by preparative TLC, by direct comparison with an authentic sample of dihydrolupeol.

(iii) A crystalline solid m.p. 201–202°, identified as β-amyrin by comparison of its physical and spectral properties with the reported values.[2]

(iv) Two aromatic amides I and II. The UV spectrum (EtOH) of amide I, m.p. 149–151° (leaflets from CH_2Cl_2–EtOH) (Found: C, 71·2; H, 6·4; N, 5·1. Calc. for $C_{16}H_{17}NO_3$: C, 70·8; H, 6·3; N, 5·1%), was compared with those of acetaniside, acetanilide, *N*-methylanisamide and *N*-methylbenzamide, indicating clearly that it and *N*-methylbenzamide possessed a common chromophore. Furthermore, in the NMR (60 MHz in $CDCl_3$) the amide hydrogen of the anilides resonates at about δ 8·0, and in the benzamides at about δ 6·7. Amide I showed a signal at δ 6·37, which led to its formulation as (±)-*N*-benzoyl [2-hydroxy-2(4′-methoxyphenyl)]ethylamine, tembamide.[3]



(I) R = $-COC_6H_5$

(II) R = $-COCH{=}CHC_6H_5$

Amide II, m.p. 175–176° (leaflets from EtOH); $[\alpha]_D^{25}$ 0 ($CHCl_3$) (Found: C, 72·8; H, 6·4; N, 4·8; O, 16·0. Calc. for $C_{18}H_{19}NO_3$: C, 72·7; H, 6·4; N, 4·7; O, 16·1%), showed in its IR spectrum (KBr) in addition to the bands associated with a secondary amide, a strong

---

* Partly presented at the Annual Meetings of the ASOVAC, Caracas, 1967 and 1971.

[1] M. J. O'NEAL, JR. and T. P. WIER, *Analyt. Chem.*, **23**, 830 (1951).

[2] B. TURSCH, R. SAVOIR, R. OTTINGER and G. CHIURDOGLU, *Tetrahedron Letters* 539 (1967).

[3] S. M. ALBONICO, A. M. KUCK and V. DEULOFEU, *J. Chem. Soc.* 1327 (1967).

absorption at 982 cm^{-1}, similar to that found in cinnamic acid derivatives.[4] Also a bathochromic shift of 9 nm in the UV spectrum, compared with that of tembamide (I), indicated that a conjugated double bond had been incorporated into the tembamide skeleton. The presence of a cinnamoyl residue was further demonstrated by NMR spectroscopy (DMSO), where the vinylic protons appeared as two doublets at δ 6·67 and δ 7·10, with a coupling constant of 16 Hz indicative of their *trans* disposition. Other signals appeared at δ 7·1–7·5 (complex, 9 aromatic protons), δ 5·39 (1 proton, quartet, $J = 5$, 2 Hz, attributed to $HO—C\underline{H}—CH_2—$), δ 3·70 (3 protons, singlet, $—OC\underline{H}_3$), δ 3·33 (3 protons; one D_2O exchangeable singlet due to $—O\underline{H}$ overlapping a multiplet due to $HO—CH—C\underline{H}_2$), and δ 8·15 (1 proton, $N\underline{H}$). Amide II was thus identified as (±)-*N*-cinnamoyl[2-hydroxy-2(4′-methoxyphenyl)] ethylamine, aegeline, and the NMR provides additional proof of the structure originally proposed by Chatterjee.[5]

Re-extraction of the bark with hot methanol, yielded a mixture of three quaternary bases, two alkaloids, III and IV, and a flavonoid glycoside identified as hesperedin[6] by direct comparison, and comparison of the aglycone hesperetin obtained on mild acid hydrolysis, with authentic samples.

The quaternary bases, separated by alumina chromatography, were purified as their chloride salts and identified by direct comparison, or derivative preparation and comparison, with authentic samples, as *N*-methyl-α(−)-canadine, (+)-laurifoline and cheleritrine.[7]

Alkaloid III, (analysed as the chloride), m.p. 245° with decomposition (yellow needles from methanol) (Found: C, 62·3; H, 4·4; N, 3·9; Cl, 9·5. $C_{20}H_{16}NO_5Cl$ requires: C, 62·3; H, 4·1; N, 3·6; Cl, 9·2%), showed absorption maxima at 234, 280 and 320 nm in the UV, and in addition to aromatic absorption, at 3450 cm^{-1} and 2860–2940, 1260 cm^{-1} in the IR which were ascribed to hydroxyl group(s) and methylenedioxy group(s), the latter confirmed by a positive Lavat test.

Alkaloid IV, m.p. 216° (white needles from benzene, or methanol) (Found: C, 71·2; H, 4·3; O, 18·9. $C_{15}H_{11}NO_3$ required: C, 71·2; H, 4·4; O, 18·9%), IR absorptions at 3000–2850 and 1250 cm^{-1} (ether linkages) and bands ascribed to aromatic absorption, and UV maxima at 243, 256, 276, 288 and 325 nm. Addition of acid caused a bathochromic shift to maxima at 266, 279, 313 and 340 nm, a characteristic of quinoline alkaloids[8] which are known to occur in the Rutaceae. However an extensive literature search failed to locate a compound possessing similar properties.

Unfortunately, due to the instability of III and the low yield of IV, further progress must await new experimental work.

[4] M. ST. C. FLETT, *J. Chem. Soc.*, 962 (1951).

[5] A. CHATTERJEE, S. BOSE and S. K. SRIMANY, *J. Org. Chem.* **24**, 687 (1959).

[6] (a) H. ARAKAWA, M. NAKAZAKI, *Ann.* **636**, 111 (1960); (b) H. RÖSLER, T. J. MABRY, M. F. CRANMER and J. KAGAN, *J. Org. Chem.* **30**, 4346 (1965).

[7] TETSUJI KAMETANI, *The Chemistry of the Isoquinoline Alkaloids*, Elsevier, New York (1969) and references therein.

[8] A. W. SANGSTER and K. L. STUART, *Chem. Rev.* **88**, 69 (1965).

Key Word Index—Zanthoxylum ocumareuse; Rutaceae; *n*-alkanes; lupeol; β-amyrin; amides; hesperedin; alkaloids; quaternary bases.