Picalinal - A Key Alkaloid of Picalima Group from *Alstonia scholaris* R. Br.¹

The reported hypotensive and anticancer activities² of the crude extracts of stem-bark of *Alstonia scholaris* R. Br. (Sanskrit: saptaparna; family: Apocynaceae) and our interest in the biosynthesis of non-tryptophan C₉₋₁₀ unit in indole alkaloids³ led to the detailed investigation of the constituents of this plant. The present communication describes the isolation and constitution of a missing key alkaloid of picalima group from the leaves of *Alstonia scholaris* R. Br.

The concentrated alcoholic extract of the fresh leaves of the plant was macerated with 2N tartaric acid and then defatted with light-petroleum. The pH of the aqueous solution was brought down successively to 5 and 9. The weak and strong bases were extracted separately with benzene and ethyl acetate respectively. Column chromatography of the weak bases on neutral alumina gave picrinine (Ia)⁴ and a new alkaloid. The ethyl acetate extract similarly gave a compound, mp 236°; C₂₁H₂₄N₂O₃ (M⁺, 352) which was characterized as akuammidine⁵.

The new alkaloid, C₂₁H₂₂N₂O₄ (M⁺, 366), mp 179–180°, [α]_D²⁰ –179.7° (CHCl₃; c, 1.78); showed a UV-spectrum at λ_{max} (EtOH) 237 and 293 nm (log ϵ 3.87 and 3.43 respectively) characteristic of an indoline system. The IR-spectrum (CHCl₃) supported the presence of an NH group (3370 cm⁻¹) and indicated an ester C=O (1730 cm⁻¹, shoulder) and an aldehyde function (1720 and 2750 cm⁻¹). The NMR-spectrum (CDCl₃) showed the following signals:

τ 8.49, dd (J 2 and 7 Hz), 3, =C^{CH₃}_H; 6.30, s, 3, CO₂CH₃; 5.15, d (J 2.5 Hz) 1, ^O_NCH; 4.59, bq (J 7 Hz), 1, =C^{CH₃}_H; 4.47, bs, 1, NH; 2.56–3.44, m, 4 ar. H; 1.42, s, 1, HC=O.

Sodium borohydride reduction of the base afforded an alcohol, mp 194–195°. The NMR-spectrum of the latter was similar to that of the new base, except that the aldehydic proton singlet had been replaced by signals at τ 6.40 (2H) and 6.42 (1H) respectively corresponding to a CH₂OH group. Further, treatment of this alcohol with aqueous alcoholic potassium hydroxide at 80° for 15 min readily gave a compound, C₂₀H₂₂N₂O₃, formed by the loss of elements of formaldehyde and identical with

picrinine. It is obviously a retroaldol type of reaction involving HO·CH₂·C^{CH₃}·CO₂CH₃ grouping. The alcohol was thus identified as desacetylpicalinal (Ic)⁶.

The foregoing evidence led to the constitution (Ib) for the new base identical with picalinal prepared earlier by BRITTEN and SMITH⁶ by the chromic acid oxidation of (Ic). This assignment received support from the conversion of picalinal to (Ia) on alkali treatment and by its mass spectrum which showed, apart from the M⁺ peak, abundant ions at m/e 338, 337 (base peak, M-29), 307 (M-59), 277 [M-(29+59+1)], 239 (M-127, due to loss of OHC-C-CO₂CH₃ together with CO derived from C-5 and a H transfer), and 130.

In view of the present status of the biogenetic theory concerning indole alkaloids, picalinal would appear to be a key intermediate for the biosynthesis of several indole alkaloids (i.e., picaline, desacetylpicalinal, vincarcine⁷, picrinine and echitamine). The present isolation of this hitherto missing alkaloid provides an additional example of a natural product previously known as a semi-synthetic laboratory product^{8,9}.

Zusammenfassung. Aus den Blättern von *Alstonia scholaris* R. Br. sind Pikrinine (Ia), Akuammidine und ein neues, bisher in Pflanzen nicht gefundenes Alkaloid, Pikralinal (Ib) isoliert worden. Pikralinal ist eine Schlüsselsubstanz für die Biosynthese vieler Alkaloide des Pikralimatypus.

R. C. RASTOGI, R. S. KAPIL
and S. P. POPLI

Central Drug Research Institute,
Lucknow (India), 8 April 1970.

¹ Part IV in the series *Studies in Medicinal Plants*; Part III: F. ANWER, S. P. POPLI, R. M. SRIVASTAVA and M. P. KHARE, *Experientia* 24, 999 (1968).

² M. L. DHAR, M. M. DHAR, B. N. DHAWAN, B. N. MEHROTRA and C. RAY, *Indian J. exp. Biology* 6, 232 (1968).

³ A. R. BATTERSBY, J. C. BYRNE, R. S. KAPIL, J. A. MARTIN, T. G. PAYNE, D. ARIGONI and P. LOEW, *Chem. Commun.* (1968), 951; and references therein.

⁴ A. CHATTERJEE, B. MUKHERJEE, A. B. RAY and B. DAS, *Tetrahedron Lett.* (1965), 3633.

⁵ R. H. F. MANSKE, *The Alkaloids* (Academic Press, London 1965), vol. 8, p. 131.

⁶ A. Z. BRITTEN and G. F. SMITH, *J. chem. Soc.* (1963), 3850.

⁷ KH. T. ILYASOVA, V. M. MALIKOV and S. YU. YUNUSOV, *Khim. Priir. Soedin* 4, 327 (1968).

⁸ Communication No. 1507 from the Central Drug Research Institute, Lucknow.

⁹ Since the submission of this manuscript, we have come across the work of D. A. EVANS, J. A. JOULE and G. F. SMITH, *Phytochemistry*, 7, 1429 (1968) wherein they have reported the isolation of picalinal from *Rhyza stricta*.

Fluorescent Metabolites in Mold-Damaged Wheat Flour

Cereals stored at elevated temperatures and high moisture levels show rapid increases in mold count and extensive lipid breakdown^{1,2}. In the case of wheat flour, the breadmaking properties are seriously impaired and deterioration is accompanied by the formation of several fluorescent compounds of unknown structure³. The pos-

sibility that those compounds were fungal toxins⁴ prompted further investigation.

Four wheat flours (with moisture contents of about 18%) stored for about 16 weeks at temperatures of 23, 30 or 37 °C showed a decrease in petroleum-ether-extractable lipids from 0.75–0.89% to 0.17–0.36% and an