Phytochemistry, 1974, Vol. 13, pp. 503 to 504. Pergamon Press. Printed in England.

CARAPANAUBINE: AN OXINDOLE ALKALOID FROM *BLEEKERIA VITIENSIS**

SHAIDA KANJI and MALCOLM SAINSBURY

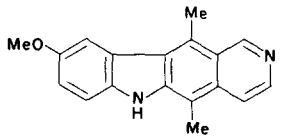
School of Chemistry and Chemical Engineering, University of Bath, Somerset, BA2 7AY

(*Received* 7 *May* 1973. *Accepted* 30 *June* 1973)

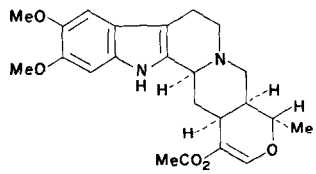
Key Word Index—*Bleekeria vitiensis*; Apocynaceae; alkaloids; carapanaubine; isoreserpiline; isoreserpiline-ψ-indoxyl; bleekerine.

Abstract—The stem-bark of *Bleekeria vitiensis* A. C. Smith contains traces of the oxindole alkaloid carapanaubine as well as isoreserpiline-ψ-indoxyl. The co-occurrence of these two compounds is of probable biosynthetic significance, representing alternative oxidative rearrangement products of the alkaloid isoreserpiline.

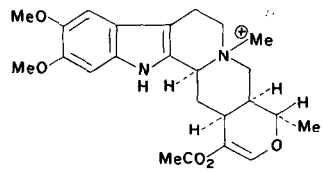
IN PREVIOUS work[1,2] we have shown that the Fijian plant *Bleekeria vitiensis* (Markgraf) A. C. Smith, Apocynaceae, is an abundant source of 9-methoxyellipticine (**1**) and isoreserpiline (**2**). A number of minor alkaloids are also present including holeinine (**3**), isoreserpiline-ψ-indoxyl (**4**) and bleekerine (**5**).



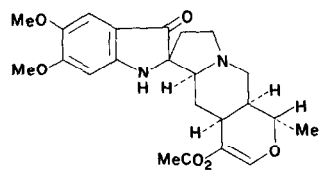
(1)



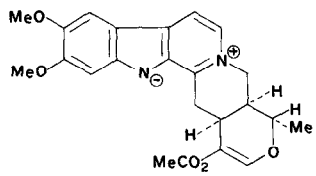
(2)



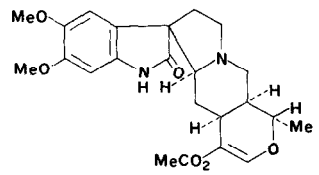
(3)



(4)



(5)



(6)

In this communication we report the isolation of the oxindole alkaloid carapanaubine (**6**) from the stem-bark of *B. vitiensis*. Although this alkaloid has been isolated previously from Apocynaceous plants,[3] the discovery of it together with isoreserpiline-ψ-indoxyl is unique and interesting.

The primary site of synthesis of isoreserpiline in *B. vitiensis* appears to be the leaves. In other parts of the plant the concentration is much lower.[2] Although this alkaloid is invariably

* Part III in the series "Extractives of the Ochrosiinae". For Part II see Ref. 2.

[1] KILMINSTER, K. N., SAINSBURY, M. and WEBB, B. (1972) *Phytochemistry* **11**, 389.

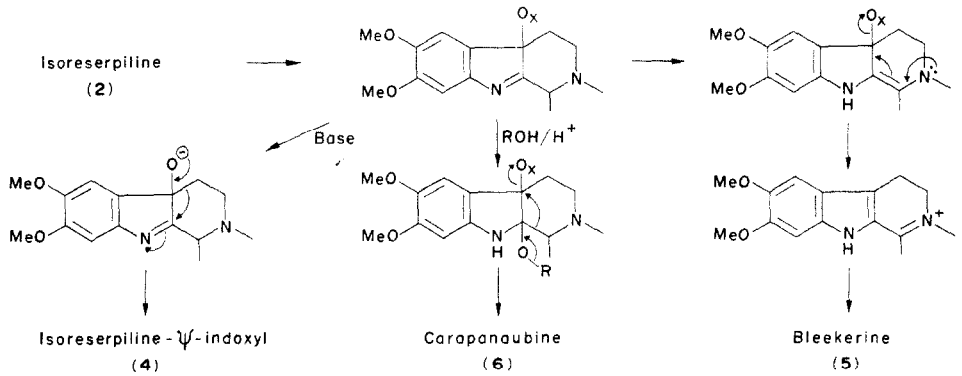
[2] SAINSBURY, M. and WEBB, B. (1972) *Phytochemistry* **11**, 2337.

[3] GILBERT, B., BRISSOLESE, J. A., FINCH, N., TAYLOR, W. I., BUDZIKIEWICZ, H., WILSON, J. M. and DJERASSI, C. (1963) *J. Am. Chem. Soc.* **85**, 1523.

accompanied by traces of isoreserpiline-ψ-indoxyl, holeinine, bleekerine and carapanaubine have only been detected in the stem-bark.

The regular co-occurrence of isoreserpiline and isoreserpiline-ψ-indoxyl lend support to the view that the latter is an artifact; nevertheless the distinctive chromatographic behaviour of this compound has enabled its detection in the very earliest phase of the extraction procedure, a fact which tends to substantiate its authenticity. It seems probable that carapanaubine and isoreserpiline-ψ-indoxyl form from isoreserpiline by alternative oxidative rearrangements. Such rearrangements have been observed *in vitro*; thus when the acetoxyindoleine (7, X = OAc) formed by lead tetra-acetate oxidation of isoreserpiline, is treated with methanolic acetic acid carapanaubine is produced,[4] but if base is employed isoreserpiline-ψ-indoxyl results.

Since we have shown[2] that lead tetra-acetate oxidation of isoreserpiline yields the zwitterionic alkaloid bleekerine, there appears to be a direct correlation between *in vitro* and *in vivo* reactions leading from isoreserpiline to bleekerine, carapanaubine and isoreserpiline-ψ-indoxyl. It seems likely that the biosynthetic routes leading to the ellipticine and isoreserpiline alkaloids are also intimately linked, but unfortunately, at the present time, there is no experimental evidence to verify this conclusion.



SCHEME 1. OXIDATIVE PRODUCTS OF ISORESERPILINE.

EXPERIMENTAL

Ground stem-bark (2 kg) was extracted exhaustively with MeOH (6 l.) and the conc. extract chromatographed on alumina (Merck neutral grade 1), eluting firstly with light petrol. (60–80°), then with light petrol.–$CHCl_3$ mixtures. Carapanaubine (2·5 mg) was isolated from fractions eluted with 80–100% $CHCl_3$–light petrol. where it occurred as a minor component; the principal extractives being sterols and 9-methoxyellipticine. Carapanaubine, m.p. 218–220°, m.m.p. 219–220° (lit.,[3] 221–223°) λ_{max}^{EtOH} 244 (log ϵ 4·20) nm was obtained as colourless prisms. MS: *m/e* 428·1948 (Found: C, 64·5; H, 6·6; N, 6·5. Calc. for $C_{23}H_{28}N_2O_6$: C, 64·5; H, 6·6; N, 6·5%). This material has identical TLC properties, in three solvent systems, to an authentic sample, generously provided by Dr. B. Gilbert, Centro de Pesquisas de Productos Naturais, Brazil. In addition, the circular dichroism curve[6] of the alkaloid is superimposable upon that recorded by Pousset *et al.*[7] for carapanaubine, thus distinguishing it from the alternative diastereoisomeric forms.

Acknowledgements—The authors thank Dr. K. Jewers, Tropical Products Institute, London for the gift of plant material and the Cancer Research Campaign for financial support.

[4] FINCH, N., GEMENDEN, C. W., HSU, I. H. C. and TAYLOR, W. I. (1963) *J. Am. Chem. Soc.* **85**, 1520.
[5] FINCH, N. TAYLOR, W. I. and ULSHAFER, P. R. (1963) *Experientia* **19**, 296.
[6] We are grateful to Dr. P. M. Scopes, Westfield College, London for determining this spectrum.
[7] POUSSET, J.-L., POISSON, J., SHINE, R. J. and SHAMMA, M. (1967) *Bull. Soc. Chim. Fr.* **8**, 2766.