Total Synthesis of Yohimbine-type Alkaloids. The Yohimbine Skeleton and Angustidine

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Summary Acylation of harmalane (I) with aroyl chloride followed by photoirradiation afforded yohimbine-type compounds [(III), (VII), and angustidine (VI)].

Enamide photocyclisation[1] of a benzoyl derivative of harmalane gave a yohimbine derivative (III) and angustidine (VI), a new alkaloid from a *Strychnos* plant.[2]

N-Benzoylation of harmalane (I) with benzoyl chloride afforded compound (II) (85%).† A 0·02 M methanolic solution of the enamide (II) was irradiated for 8 h with a low pressure mercury lamp at room temperature.[1] Chromatography of the reaction mixture gave the oxoyohimbine derivative (III) (36·5%), m.p. 299—300° (lit. 299°).‡ Lithium aluminium hydride followed by sodium borohydride reductions afforded the tertiary amine (IV), m.p. 191—193° (lit.,[4] 191—192°).[3,5]

This process was then applied to the first total synthesis of angustidine, which is a new type of alkaloid from *Strychnos angustiflora*.[2]

Thus *N*-acylation of harmalane (I) with 6-methylnicotinoyl chloride afforded the corresponding *N*-acylate (V) (47%).‡

Similar irradiation of the enamide (V) for 8 h afforded two photocyclised products [(VI) and (VII)] (20·5 and 13% respectively) which were separated by chromatography on alumina: (VI), m.p. >300° (lit. 309—311°),[2] (VII), m.p. >300°.† Compound (VI) was shown to be angustidine[3] by comparisons of m.p., and i.r., and n.m.r. spectra.

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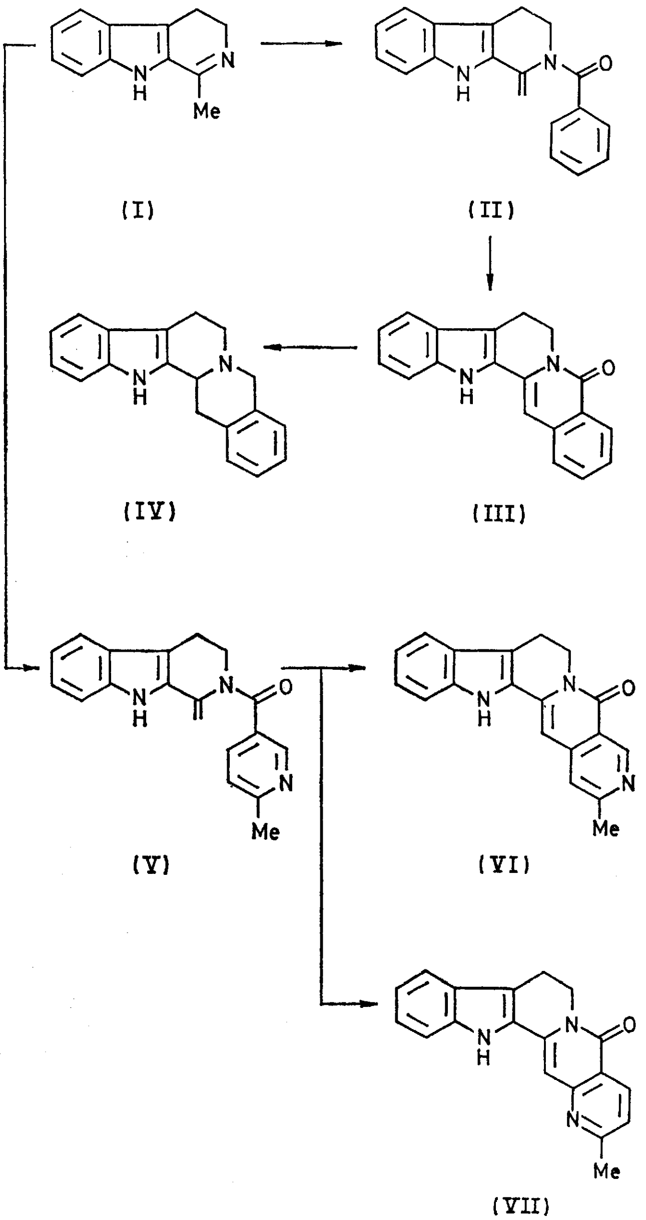

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† Structure established from i.r. and n.m.r. spectroscopy.

‡ Structure established from n.m.r. spectroscopy.

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