The Biological Conversion of Loganin into Indole Alkaloids

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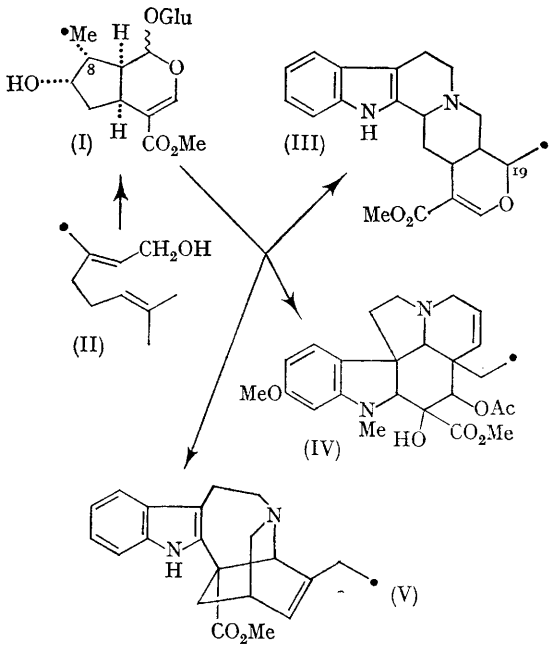
FOLLOWING the demonstration that geraniol is a good precursor of the non-tryptophan derived portion of different indole alkaloids,[1–4] attention has been centred on the monoterpene glucoside loganin (I)[5,6] as a possible intermediate in the biosynthetic sequence.[7] Preliminary evidence obtained with *O*-methyl-labelled material was positive but not entirely devoid of ambiguity.[8] The availability of ring-labelled loganin[5] has now made possible a crucial test of this hypothesis.

[^{14}C]Loganin carrying the bulk of the label in the C-8 methyl group, as in (I), was isolated from

rhizomes of *Menyanthes trifoliata* after exposure to the methyl-labelled geraniol (II) and purified to constant activity through the penta-acetyl derivative.[5] An aqueous solution of (I) was supplied to young shoots of *Vinca rosea*. After 6 days, isolation and purification to constant activity gave the following alkaloids: ajmalicine (III; 0·1% incorp.), vindoline (IV; 0·2% incorp.), and catharanthine (V; 0·3% incorp.). Kuhn–Roth degradation of ajmalicine afforded acetic acid containing 93% of the radioactivity. Since C-19 in (III) is known to be derived specifically from C-3 of mevalonate,[2] the label must be restricted to the methyl group. Similar degradation of (IV) and (V) established that all of the label (108 and 107% respectively) was located at the indicated positions. These results document the ability of *Vinca rosea* to convert loganin into the three main types of indole alkaloids. In experiments with labelled sodium mevalonate we have confirmed a previous report[8] that the same plant is able to biosynthesise loganin. Therefore this compound meets two of the important requirements which are characteristic for true intermediates.



Incorporation of ring-labelled loganin into a variety of indole alkaloids has been independently observed by Battersby and his co-workers and is outlined in the accompanying communication.

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[8] A. R. Battersby, R. T. Brown, R. S. Kapil, J. A. Martin, and A. O. Plunkett, *Chem. Comm.*, 1966, 890.