Synthesis of "Homoerythrinadienone" by Phenolic Oxidative Coupling

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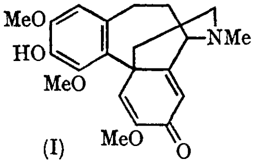
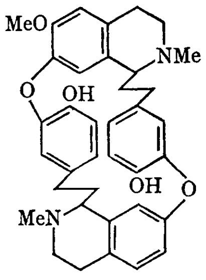
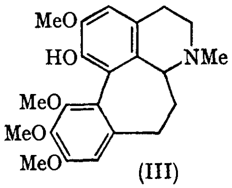
RECENTLY, several groups of alkaloids, androcymbine (I), melanthioidine (II), and kreysigine (III), derived biogenetically by phenolic oxidation of 1-phenethylisoquinolines, have been isolated and some of these were synthesized by Battersby[1] and present authors.[2] Since Scott[3] and Mondon[4] have independently synthesized "erythrinadienone" (V), which is an interesting compound in the biogenesis of Erythrina alkaloids, by oxidation of phenolic base (VI), we report a simple, though interesting, extension of this to synthesize "homoerythrinadienone" (IV).



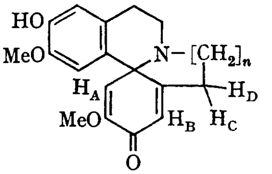
(I)



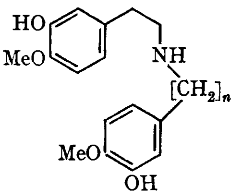
(II)



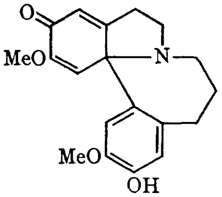
(III)



(IV) $n=2$
(V) $n=1$



(VI) $n=2$
(VII) $n=3$



(VIII)

The secondary amine (VII) hydrochloride[5] was oxidized by violent shaking with potassium ferricyanide, buffered by 8% ammonium acetate and 10% ammonia in chloroform, for 1·5 hr. at 20°. The careful work-up, which involved silica gel chromatography using $CHCl_3$–MeOH (49 : 1) as an eluant gave our expected homoerythrinadienone, m.p. 135—137°, in 4·2% yield. The microanalysis verified the formula of (V) or (VIII) [Found: C, 67·25; H, 6·65. $C_{19}H_{21}O_4N$, $\frac{2}{3}H_2O$ requires C, 67·25; H, 6·6%] and the infrared [ν_{max} ($CHCl_3$) 3505, 1670, 1652, 1618 cm.$^{-1}$] and ultraviolet ([λ_{max} in MeOH) 236, 278 mμ] were in accord with an expected dienone system. The n.m.r. spectrum (τ in $CDCl_3$) revealed two singlet aromatic protons (3·30, 3·42), olefinic protons (H_A, 3·60, singlet and H_B, 3·73, triplet, J = 1·8 c./sec.; allyl coupling with H_C and H_D), methyl singlets (6·30, 6·36) and broad CH_2-multiplets (10 H, 6·5—7·5).

Although this data indicted that the oxidized product was either structure (IV) or (VIII), we tentatively assigned the product to be structure (IV), on the thermodynamic basis that the formation of a six-membered ring is easier than that of five- or seven-membered ring.

In this case, the oxidation of (VII) by other reagents, for example, ferric chloride oxidation, afforded only polymeric products. We are now synthesizing further homobenzylisoquinoline type compounds such as homoprotoberberine.

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[3] J. E. Gervay, F. McCapra, T. Money, G. M. Sharma, and A. I. Scott, *Chem. Comm.*, 1966, 142.

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