

SYNTHETIC APPROACH TO STEMODIN RING SYSTEM

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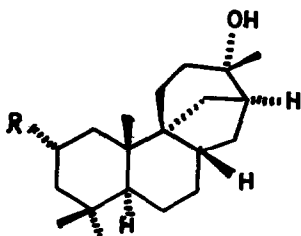
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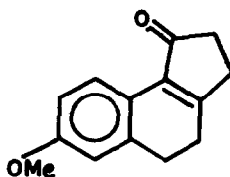
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The recently isolated diterpenes stemodin (I)<sup>1</sup> and stemodinone (II)<sup>1</sup> possess an unusual tetracyclic skeleton. We report a simple synthesis of the tetracyclic compound (III) which incorporates the basic stemodane skeleton and possesses desired stereochemistry at each of the asymmetric centres.



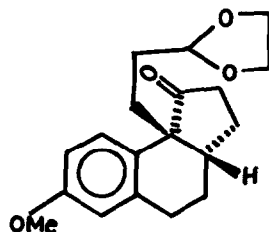
I, R = OH

II, R = O

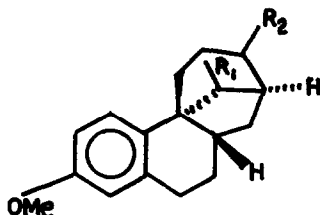


IV

V, 1,2-dihydro IV



VI



- X, R<sub>1</sub> = H<sub>2</sub> , R<sub>2</sub> = OTHP  
 III, R<sub>1</sub> = H<sub>2</sub> , R<sub>2</sub> = O  
 VII, R<sub>1</sub> = O , R<sub>2</sub> = OH  
 VIII, R<sub>1</sub> = O , R<sub>2</sub> = O  
 IX, R<sub>1</sub> = O , R<sub>2</sub> = OTHP

Reduction of 6-methoxy-3'-oxo(2',1',1,2)cyclopentonaphthalene<sup>2</sup> with excess sodium and ethanol in liquid ammonia afforded the dihydroderivative (IV) in 87% yield<sup>3</sup>; m.p. 130°;  $\nu_{\max}(\text{CHCl}_3)$  1685, 1630, 1600  $\text{cm}^{-1}$ ;  $\lambda_{\max}(\text{EtOH})$  248, 290 nm ( $\epsilon = 16,000$  and 8,830 respectively);  $\delta(\text{CDCl}_3)$  8.14 (1H, d,  $J = 8$  Hz), 6.8-6.6 (2H, m), 3.78 (3H, s), 3.1-2.36 (8H, m). Catalytic hydrogenation of (IV) over palladium-charcoal (5%) in dimethylformamide<sup>4</sup> furnished the *cis*<sup>4,5</sup>-benzhydrindanone (V) in 93% yield; m.p. 88°;  $\nu_{\max}(\text{CHCl}_3)$  1740, 1600  $\text{cm}^{-1}$ ;  $\delta(\text{CDCl}_3)$  7.4-6.54 (3H, m), 3.7 (3H, s), 3.26-1.5 (10H, m); t.l.c. - single spot [benzene - petroleum ether (60-80°), 3:1]. The ketone (V) was alkylated in 1,2-dimethoxyethane with 1-bromo-3,3-ethylenedioxypropane in the presence of dry potassium *tert*-pentyloxyde. The alkylated product (VI) was obtained in 58% yield;

b.p. 170°/0.05 mm;  $\delta(\text{CCl}_4)$  7.3 (1H, d,  $J = 8$  Hz), 6.74–6.34 (2H, m), 4.58 (1H, t,  $J = 5$  Hz), 3.67 (3H, s), 3.86–3.52 (4H, m), 2.8–1.2 (13H, m); the stereochemistry has been assigned on the basis of analogy<sup>6</sup>. Deacetalisation of (VI) with acetic acid (80%) and subsequent aldol condensation<sup>7</sup> of the resulting ketoaldehyde afforded an epimeric mixture of the ketol (VII) in 42% yield; m.p. 145–155°;  $\nu_{\text{max}}(\text{CHCl}_3)$  3360, 1735, 1600  $\text{cm}^{-1}$ ;  $\delta(\text{CDCl}_3)$  7.46–6.52 (3H, m), 4.4–4.0 (1H, m), 3.74 (3H, s), 2.9–1.34 (12H, m). Oxidation of the ketol (VII) with Jones reagent furnished the crystalline diketone (VIII); m.p. 125°;  $\nu_{\text{max}}(\text{CHCl}_3)$  1740, 1705, 1600  $\text{cm}^{-1}$ ;  $m/e$  270. The tetrahydropyranyloether (IX) derived<sup>8</sup> from the ketol mixture (VII) was subjected to modified Wolf-Kishner reduction<sup>9</sup> to afford (X);  $\nu_{\text{max}}(\text{CHCl}_3)$  1600  $\text{cm}^{-1}$ . Hydrolysis<sup>10</sup> of the pyranylether (X) followed by Jones oxidation furnished the ketone (III); m.p. 98°;  $\nu_{\text{max}}(\text{CHCl}_3)$  1705, 1600  $\text{cm}^{-1}$ ;  $m/e$  256. Further elaboration to complete the synthesis of stemodin is in progress.

## REFERENCES

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