
A biomimetic one-step synthesis of (±)-3,10-dihydroxydielmentha-5,11-diene-4,9-dione

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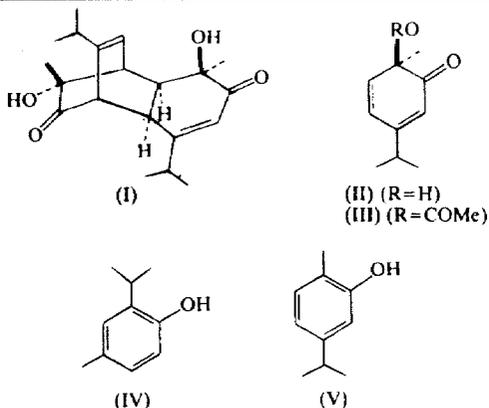
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3,10-Dihydroxydielmentha-5,11-diene-4,9-dione(I), isolated from *Callitris macleayana*, is a dimeric monoterpene which is derived biogenetically by self-condensation of quinol (II) in a Diels-Alder reaction.¹ Dimer (I) occurs naturally in an optically active form and appears to be one of the few examples known to date of Diels-Alder reaction under enzymatic control.^{1,2} The structure (I) was assigned on the basis of chemical degradation, one and two dimensional n.m.r. spectroscopy and a single crystal X-ray analysis. Carman and co-workers³ recently reported the synthesis of racemic (I) via self dimerisation from the quinol acetate (III) under conditions of acid hydrolysis. The Diels-Alder reaction was found to be unusually difficult but could be effected by following a specially developed procedure. The suggested biogenesis of compound (I) prompted the authors to undertake its

synthesis on these lines and the results are now reported.

It is well known that *o*-quinols readily dimerise, one molecule acting as a diene, the other as dienophile.⁴ Based on previous experience⁵ of the reaction of isothymol (IV) with various oxidising agents, the generation of *o*-quinol (II) by oxidation of carvacrol (V) with iodic acid and sodium metaperiodate was considered.

The reaction of carvacrol (0.027 mol) with iodic acid (0.047 mol) in aqueous ethanol at room temperature provided, after preparative t.l.c. on silica gel, two compounds, A, mp 156°C, and B, mp 138-9°C, in yields of 6 and 30 per cent respectively. Careful t.l.c. with different solvent systems showed that compound A was still contaminated with compound B. It has not been possible to purify it further and it remains to be characterised. Compound B was identified as racemic (I)



by direct comparison (mp, infrared and ^1H n.m.r. spectral measurements).

The oxidation of carvacrol (V) with sodium metaperiodate gave crystalline (\pm)-(I) in 12 per cent yield. It is noteworthy that oxidation with sodium metaperiodate is a much cleaner reaction and gives racemic (I) as the only isolable product, albeit in low yield.

In contrast to the difficulty observed in the Diels-Alder dimerisation of quinol acetate (III), the presumed

intermediate quinol (II) undergoes dimerisation under mild conditions.

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