Oxidation of α-Methoxychalcones

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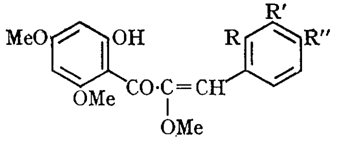
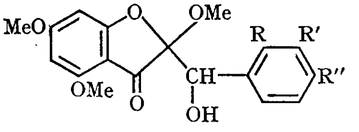
THE products obtained from the Algar–Flynn–Oyamada (A.F.O.) reaction (oxidation of 2'-hydroxychalcones by alkaline hydrogen peroxide) include flavonols, dihydroflavonols, aurones,[1] 2-benzyl-2-hydroxycoumaran-3-ones, and 2-arylbenzofuran-3-carboxylic acids.[2] Current work in these laboratories has shown that the application of this reaction to phloroglucinol type α-methoxychalcones results in the production of a new structure, 2-α-hydroxybenzyl-2-methoxycoumaran-3-one and not as previously reported the corresponding 3-methoxyflavones.[3]

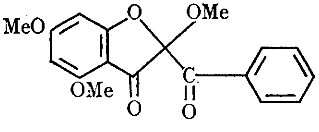
Oxidation of 2'-hydroxy-α-4',6'-trimethoxychalcone[4] (Ia) in aqueous methanol containing sodium hydroxide (1N) with hydrogen peroxide (6%) at 5° for 24 hr. gave 2-α-hydroxybenzyl-2,4,6-trimethoxycoumaran-3-one (IIa) (yield 80%) and 2-hydroxy-4,6-dimethoxybenzoic acid (0·02%).



(I)



(II)



(III)

(a) R=R'=R''=H (b) R=OMe, R'=R''=H

(c) R''=OMe, R=R'=H (d) R=H, R'=R''=OMe

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[1] T. S. Wheeler, *Rec. Chem. Progr.*, 1957, **18**, 133.

[2] B. Cummins, D. M. X. Donnelly, E. M. Philbin, J. Swirski, T. S. Wheeler, and R. K. Wilson, *Chem. and Ind.*, 1960, 348.

[3] N. Narasimhachari, S. Narayanaswami, and T. R. Seshadri, *Proc. Indian Acad. Sci.*, 1953, **37**, 104.

[4] Y. Kimura and M. Hoshi, *Proc. Imp. Acad. (Tokyo)*, 1936, **12**, 285.

Further oxidation of 2-α-hydroxybenzyl-2,4,6-trimethoxycoumaran-3-one (IIa) with sodium dichromate gave 2,4,6-trimethoxybenzoylcoumaran-3-one (III). This diketone (III) was synthesised by periodic oxidation[5] of the corresponding flavonol and subsequent methylation of the hydroxyl group at position 2.

Table

Chalcone	*Temperature* (°c) [*Time*]	*Products*
2′-Hydroxy-α,2,4′,6′-tetramethoxychalcone (Ib)	21 [72 hr.]	(i) 2-α-Hydroxybenzyl-2,2′,4,6-tetramethoxycoumaran-3-one (IIb) [50%] (ii) 5,7,2′-Trimethoxyflavonol [10%]
2′-Hydroxy-α-4,4′,6′-tetramethoxychalcone (Ic)	5 [24 hr.]	(i) 2-α-Hydroxybenzyl-2,4,4′,6-tetramethoxycoumaran-3-one (IIc) [62%] (ii) 5,7,4′-Trimethoxyflavonol [11%]
2′-Hydroxy-α,3,4,4′,6′-pentamethoxychalcone (Id)	21 [72 hr.]	(i) 2-α-Hydroxybenzyl-2,3′,4,4′,6-pentamethoxycoumaran-3-one (IId) [65%] (ii) 5,7,3′,4′-Tetramethoxyflavonol

The Table shows the results obtained by A.F.O. oxidation of the listed chalcones.

Difficulty was encountered in the oxidation of compound (IId) with sodium dichromate but treatment with manganese dioxide in methylene chloride resulted in smooth reaction.

Satisfactory spectroscopic and analytical data were obtained for the new compounds isolated.

The effect of different substitution patterns in the A and B rings and of α-alkyl and α-aryl substituents in the course of these reactions is at present under investigation.

The 2-α-hydroxylbenzyl-2-methoxycoumaran-3-ones above have not been previously synthesised nor have they as yet been isolated from natural sources.

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[5] M. A. Smith, *J. Org. Chem.*, 1963, **28**, 933.

[6] Y. Kimura, *J. Pharm. Soc. Japan*, 1938, **58**, 415.