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THE SYNTHESES OF RIPARIOCHROMENE A AND METHYL-RIPARIOCHROMENE A

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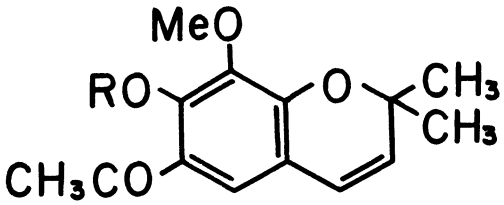
7,8-Dimethoxy-2,2-dimethylchroman was obtained from pyrogallol trimethyl ether and β,β-dimethylacrylyl chloride via the corresponding chroman-4-one. The Friedel-Crafts reaction of the chroman with acetyl chloride yielded 6-acetyl-7-hydroxy-8-methoxy-2,2-dimethylchroman. The dehydrogenation of the acetylchroman with DDQ in anhydrous benzene afforded riparіochromene A.

Riparіochromene A has recently been isolated along with several chromenes from Australian Eupatorium riparium Regel.[1] Its structure has been shown to be 6-acetyl-7-hydroxy-8-methoxy-2,2-dimethylchromene (I) with an unique 1,2,3-trioxygenated pattern on the basis of the spectral evidence.[1] Also methyl-riparіochromene A (methyl ether of I) (II) has been isolated from Australian[1] and Jamaican E. riparium Regel.[2] The present paper will describe the syntheses of I and II from 7,8-dimethoxy-2,2-dimethylchroman (III) and will attempt to confirm the structures of the natural chromenes.

The condensation of pyrogallol trimethyl ether (IV) and β,β-dimethylacrylyl chloride (V) in the presence of anhydrous aluminum chloride for 52 hr gave 7,8-dimethoxy-2,2-dimethylchroman-4-one (VI) (mp 75-75.5°C; IR ν_{max}^{Nujol} 1693 cm^{-1}). When the above condensation was allowed to proceed for a relatively short period of time, 2-hydroxy-3,4-dimethoxyphenyl 2-methyl-1-propenyl ketone (VII) (mp 66.5-67°C; IR 1642 cm^{-1}) was obtained along with a small amount of VI. VII was easily converted into VI with hydrochloric acid in acetic acid. The Clemmensen reduction of VI gave the chroman III[3] [colorless liquid; NMR $\delta_{ppm}^{CDCl_3}$: 1.78_t, 2.72_t (each J=7 Hz and 2H) (CH_2-CH_2)]. By the Fridel-Crafts reaction, III was condensed with acetyl chloride to give 6-acetyl-7-hydroxy-8-methoxychroman (VIII) [mp 97-98°C; IR 1640 cm^{-1}; UV λ_{max}^{EtOH} nm (log ε): 222.5(4.30), 238(4.00), 288(4.22), 327(3.66); NMR 1.40_s (6H) (CH_3 X 2), 1.83_t, 2.76_t (each J=7 and 2H), 2.52_s (3H) (CH_3CO), 3.84_s (3H) (CH_3O), 7.26_s(5-H), 12.40_s (OH). Found: C, 67.19; H, 7.03%. Calcd for $C_{14}H_{18}O_4$: C, 67.18; H, 7.25%]. The dehydrogenation[4-6] of VIII with 2,3-dichloro-5,6-dicyano-p-quinone (DDQ) in anhydrous benzene gave the desired chromene I [mp 89.5-90.5°C; IR 1635 cm^{-1}; UV: 258(4.57), 293(3.89), 348(3.64); NMR 1.47_s (6H) (CH_3 X 2), 2.52_s (3H) (CH_3CO), 3.88_s(3H) (CH_3O), 5.58_d, 6.27_d

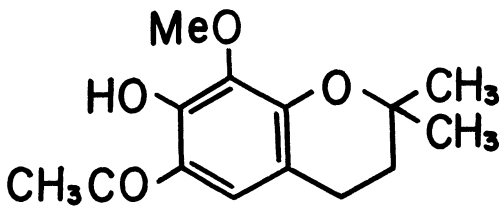
(each J=9 and 1H) (CH=CH), 7.10$_s$ (5-H), 12.80$_s$ (OH). Found: C, 67.65; H, 6.35%. Calcd for $C_{14}H_{16}O_4$: C, 67.73; H, 6.50%] (lit.[1] mp 88.5°C). Then, I was easily converted into the methyl ether II [colorless liquid; IR $\nu_{max}^{CCl_4}$ 1673 cm^{-1}; UV: 255(4.24), 290(3.68); NMR 1.47$_s$(6H) (CH_3 X 2), 2.57$_s$(3H) (CH_3CO), 3.85$_s$, 3.94$_s$ (each 3H) (CH_3O), 5.57$_d$, 6.28$_d$ (each J=9 and 1H) (CH=CH), 7.20$_s$(5-H). Mass: 262.1176 (M^+). Calcd 262.1183].

The properties of synthetic I and II were in full accord with those of the natural ripariochromene A and methyl-ripariochromene A.[7]



I R = H

II R = Me



VIII

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7) The natural chromenes were kindly supplied by Dr. T. Anthonsen, Norway Institute of Technology.

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