

Synthesis of Chromenochalcone Glucosides

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Synopsis. Some chromenochalcone glucosides were synthesized in 24–62% yields from 6-acetyl-5,8-dihydroxy-2,2-dimethylchromene and various (β -glucosyloxy)-benzaldehydes.

Chalcones containing isoprene units which have biological activities^{1,2} have been isolated from various plants^{3–7} and synthesized.⁸

We reported the synthesis of Flemichapparin-A isolated from *Flemingia Chappar* ham (Legminosae),⁹ and attempted to synthesize chromenochalcone glucosides.

As regards chalcone glucosides, many chalcones and flavonoids containing glucose moiety in ring A such as phloridzin^{10–12} have been found in various species of plants. However, only a few chalcones and flavonoids containing glucose moiety in ring B such as Epimedeside-B have been found.^{13,14} We wish to report on the synthesis of the latter compounds which are expected to have biological activities.

The Claisen-Schmidt condensation of 6-acetyl-5,8-dihydroxy-2,2-dimethylchromene (**1**) with helicin (**2**), 2-(β -glucosyloxy)-1-naphthaldehyde (**3**), isovanillin β -D-glucoside (**4**), and *p*-(β -glucosyloxy)benzaldehyde (**5**) was carried out, chromenochalcone glucosides (**6**), (**7**), (**8**), and (**9**) being obtained in fair yields. Dihydrochalcone glucoside (**10**) which tastes sweet was obtained by the catalytic hydrogenation of (**6**) with palladium-carbon in 10% aq KOH.

Experimental

1 was prepared by the previous method.⁹ **2** (mp 173.5–174 °C, 51% yield), **3** (mp 182.5–184.5 °C, 62% yield),

4 (mp 190.5–192 °C, 33% yield) and **5** (mp 162–163 °C, 57% yield) were prepared by Robertson's method.¹⁵ The products were identified by means of mp and spectral data. The physical data of **2**, **4**, and **5** agreed with those found in literatures.^{15–17}

3: mp 182–184.5 °C (brown amorphous). IR (cm⁻¹, KBr disk): 3300, 1650, 1240, 1050, 740, 710. Found: C, 61.47; H, 5.53%. Calcd for C₁₇H₁₈O₇: C, 61.07; H, 5.43%.

Reaction of 1 with 2. On cooling, 50% alcoholic KOH (4 ml) was added to a stirred solution of **1** (300 mg) and **2** (284 mg) in ethanol (4 ml) under nitrogen and the mixture was stirred at room temperature for a week. The mixture was acidified with 0.5M HCl and extracted with ether. Chromatography of the ether extract on silica gel eluted by benzene-ethylacetate (22 : 3 v/v) afforded **6** in 56% yield.

Reaction of 1 with 3. 60% Alcoholic KOH (4 ml) was added to a stirred solution of **1** (234 mg) and **3** (324 mg) in ethanol (4 ml) and the mixture was stirred at 60 °C for three days under nitrogen. By the same work-up as above, **7** was obtained in 33% yield.

Reaction of 1 with 4. 40% Alcoholic KOH (4 ml) was added to a stirred solution of **1** (234 mg) and **4** (295 mg) in ethanol (4 ml) and the mixture was stirred at 60 °C for two days under nitrogen. By the same work-up as above, **8** was obtained in 24% yield.

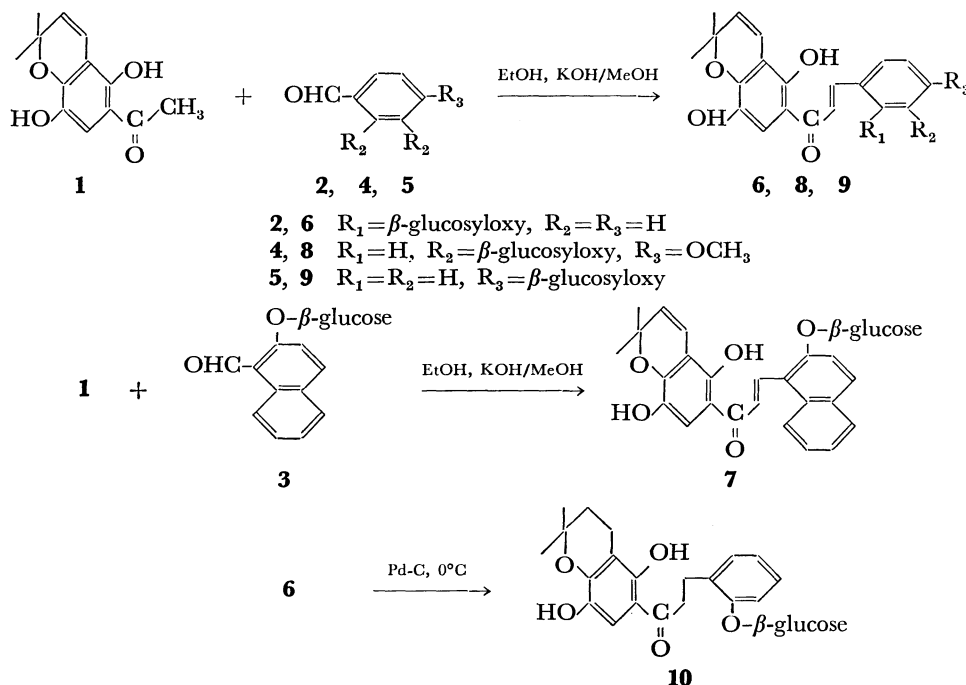
Reaction of 1 with 5. 60% Alcoholic KOH (4 ml) was added to a stirred solution of **1** (234 mg) and **5** (284 mg) in ethanol (4 ml) and the mixture was stirred at 60 °C for two days under nitrogen. By the same work-up as above, **9** was obtained in 62% yield.

The products were identified by means of their analytical and spectral data (Table 1).

Hydrogenation of 6. **6** (200 mg) was dissolved in 10% aq KOH (2 ml) and the solution was cooled to 0 °C. To this solution was added 10% palladium-carbon catalyst

TABLE 1. PHYSICAL PROPERTIES OF REACTION PRODUCTS

Products	Mp (°C)	IR (cm ⁻¹ , KBr disk)	NMR (CD ₃ OD, δ)	Found (Calcd)	
				C	H (%)
6	145.5–147 orange	3400, 1640, 1240, 1160, 1075, 960, 760	1.48(6H, s), 3.23–3.60(7H, m), 5.67 (1H, d, $J=10.0$ Hz), 6.70(1H, d, $J=10.0$ Hz), 7.0–7.52(5H, m), 7.74 (1H, d, $J=15.5$ Hz), 8.25(1H, d, $J=15.5$ Hz)	62.69 (62.39)	5.42 (5.64)
7	223–224 redish- brown	3400, 1640, 1150, 1060, 950, 770	1.48(6H, s), 3.25–3.70(7H, m), 5.79 (1H, d, $J=10.0$ Hz), 6.84(1H, d, $J=10.0$ Hz), 7.35–8.15(7H, m), 8.20(1H, d, $J=15.5$ Hz), 8.68 (1H, d, $J=15.5$ Hz)	65.72 (65.44)	5.28 (5.49)
8	214–216 orange	3400, 1660, 1240, 1170, 1060, 930, 750	1.50(6H, s), 3.22–3.70(7H, m), 3.90 (3H, s), 5.65(1H, d, $J=10.0$ Hz), 6.80(1H, d, $J=10.0$ Hz), 7.35–7.80 (6H, m)	61.24 (61.13)	5.91 (5.70)
9	140–142 orange	3500, 1670, 1070, 1035, 935, 735	1.50(6H, s), 3.20–3.65(7H, m), 5.65 (1H, d, $J=10.0$ Hz), 6.67(1H, d, $J=10.0$ Hz), 7.48–7.85(7H, m)	62.21 (62.39)	5.67 (5.64)



(50 mg), the mixture being kept at room temperature for 2 h under hydrogen with stirring. The product was filtrated and acidified with concd HCl. When the solution was kept at 0 °C overnight, the hydrogenated product was crystallized and washed with cold water. (110 mg, 55% yield) mp 123–127 °C (amorphous). IR (cm⁻¹, KBr disk): 3400, 1620, 1602, 1250, 1070. NMR (δ, CD₃OD): 1.40 (6H, s), 1.65–2.05 (4H, m), 2.05–2.95 (4H, m), 3.17–3.75 (7H, m), 7.20–7.50 (5H, m). Found: C, 61.72; H, 6.69%. Calcd for C₂₆H₃₂O₁₀: C, 61.89; H, 6.39%.

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