BULLETIN OF THE CHEMICAL SOCIETY OF JAPAN, VOL. 51 (11), 3399—3400 (1978)

Synthesis of Chromenochlalcone Glucosides

Shigetoshi YAMADA,* Futara ONO, Takao KATAGIRI† and Juntaro TANAKA†

Department of Industrial Chemistry, Junior College of Technology, Shizuoka University, Hamamatsu 432

†*Department of Synthetic Chemistry, Faculty of Engineering, Shizuoka University, Hamamatsu 432*

(Received March 29, 1978)

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 Epimedoside-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**), isovanillinβ-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 $C_{17}H_{18}O_7$: 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.

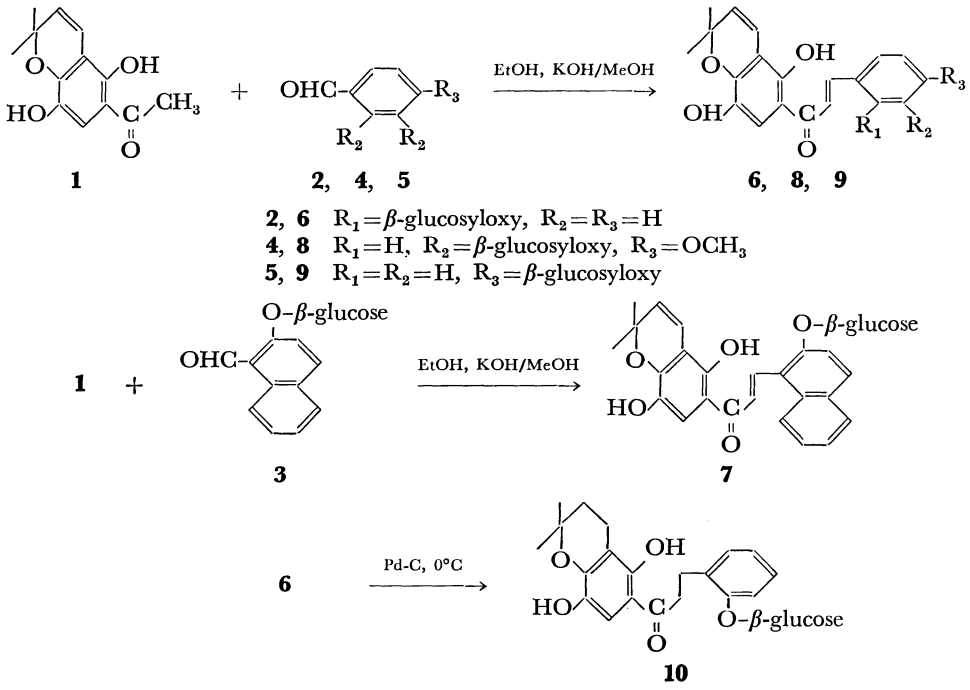
*Reaction of **1** with **5**.* 60% Alcoholic KOH (4 ml) was added to a stirred solution of **1** (234 mg) and **5** (284 mg) in ethanol (4 ml) and the mixture was stirred at 60 °C for two days under nitrogen. By the same work-up as above, **9** was obtained in 62% yield.

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_3OD, δ)	Found (Calcd) C	Found (Calcd) 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=10.0Hz), 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, CD_3OD): 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 $C_{26}H_{32}O_{10}$: C, 61.89; H, 6.39%.

References

1) K. Kyogoku, K. Hatayama, S. Yokomori, and T. Seki, *Japan Patent Kokai* 50-140430; *ibid.*, 50-24258; *ibid.*, 52-78856; *ibid.*, 52-7857; *ibid.*, 52-7858.
2) A. Lupi and M. G. Delle, *Farmaco. Ed. Sci.*, **32**, 261 (1977).
3) K. Kyogoku, K. Hatayama, K. Suzuki, S. Yokomori, K. Maejima, and M. Komatsu, *Chem. Pharm. Bull.*, **21**, 1192, 1436, 1777, 2733 (1973).
4) N. Adityachaudhury, D. Ghosh, A. Chaudhury, and C. L. Kirtaniya, *J. Indian Chem. Soc.*, **50**, 363 (1973).
5) B. S. Bajba, P. L. Khanna, and T. R. Seshadri, *Curr. Sci.*, **41**, 815 (1972).
6) K. Subrahmanyam, J. M. Rao, and K. V. J. Rao, *Indian J. Chem., Sect. B*, **15**, 12, 105 (1977).
7) L. O. Goncalves, M. E. Montogomery, and H. Arn, *Gazz. Chim. Ital.*, **103**, 771 (1973).
8) K. Kyogoku, K. Hatayama, S. Yokomori, T. Seki, and I. Tanaka, *Agric. Biol. Chem.*, **39**, 133 (1975); *ibid.*, **38**, 2291 (1974).
9) S. Yamada, F. Ono, T. Katagiri, and J. Tanaka, *Bull. Chem. Soc. Jpn.*, **48**, 2391 (1975).
10) V. K. Ahluwalium and N. Rani, *Indian J. Chem., Sect. B*, **14**, 594 (1976).
11) M. E. Montogomery and H. Arn, *J. Insect Physiol.*, **20**, 413 (1974).
12) A. F. Debons, I. Krimty, A. From, and H. Pattinian, *Am. J. Physiol.*, **226**, 574 (1974).
13) A. J. Kahra, M. Krishnamurti, and T. R. Seshadri, *Indian J. Chem.*, **12**, 1040 (1974).
14) Y. Tokuoka, K. Daigi, and T. Takemoto, *Yakugaku Zasshi*, **95**, 321 (1975).
15) A. Robertson and R. B. Waters, *J. Chem. Soc.*, **1930**, 2729.
16) P. Casparis, *Pharm. Acta Helv.*, **21**, 341 (1946).
17) Mauthner, *J. Prakt. Chim.*, **85**, 568 (1912).