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GLOCHIDIOBOSIDE, A GLUCOSIDE OF (7*S*,8*R*)-DIHYDRODEHYDRODICONIFERYL ALCOHOL FROM LEAVES OF *GLOCHIDION OBOVATUM*

YOSHIO TAKEDA*, CHIEKO MIMA, TOSHIYA MASUDA, EIJI HIRATA,† ANKI TAKUSHI‡ and HIDEAKI OTSUKA§

Faculty of Integrated Arts and Sciences, The University of Tokushima, 1-1 Minamijosanjima-cho, Tokushima, 770-8502, Japan; †Faculty of Agriculture, Ryukyu University, 1 Chihara, Nishihara-cho, Nakagami-gun, Okinawa, 903-0129, Japan; ‡134, Frugen, Yomitan-son, Nakagami-gun, Okinawa, 904-0314, Japan; §Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine, 1-2-3 Kasumi, Minami-ku, Hiroshima, 734-8551, Japan

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Key Word Index—*Glochidion obovatum*; Euphorbiaceae; (7*S*,8*R*)-dihydrodehydrodiconiferyl alcohol-9′-*O*-*β*-glucoside; glochidioboside; neolignan glucoside.

Abstract—From the leaves of *Glochidion obovatum*, a new neoligan glucoside, (7*S*,8*R*)-dihydrodehydrodiconiferyl alcohol-9′-*O*-*β*-glucoside, named as glochidioboside, was isolated along with the known compounds, blumeol C glucoside, benzyl alcohol glucoside, bergenin, dendranthemoside B and icariside B_1. The structure of the new compound was elucidated by spectroscopic methods. © 1998 Elsevier Science Ltd. All rights reserved

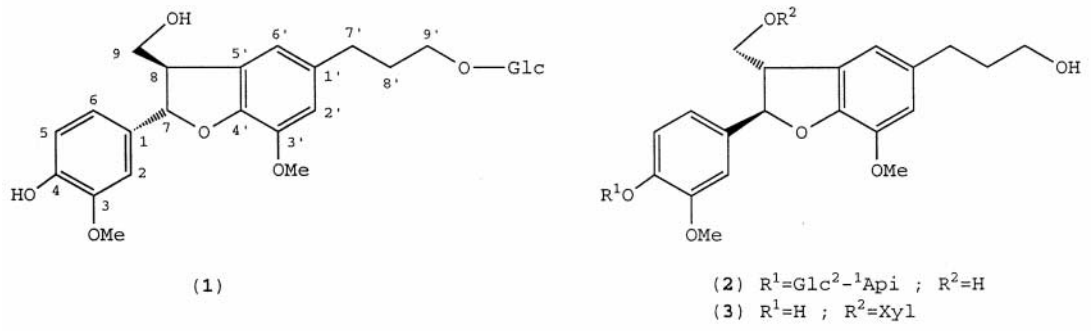
INTRODUCTION

Several triterpenoids and triterpenoid glycosides and alkaloids are known to be constituents of the plants belonging to the genus *Glochidion* [1–3]. In the course of our studies on the constituents of plants grown under subtropical climate, we examined the constituents of *G. obovatum* Sieb. et Zucc. harvested in Okinawa Prefecture, Japan and isolated a new neolignan glucoside, glochidioboside (**1**), together with three known megastigmane glucosides, blumeol C glucoside [4], dendranthemoside B [5] and icariside B_1 [6], bergenin [7] and benzyl alcohol glucoside [8]. This paper describes the isolation and structural elucidation of the new compound.

RESULTS AND DISCUSSION

Glochidioboside (1), $[\alpha]_D - 14.1^\circ$ (MeOH), was isolated from the *n*-BuOH-soluble fraction of the methanolic extracts of the leaves of *G. obovatum* by a combination of several types of chromatography (Experimental). It has the molecular formula, $C_{26}H_{34}O_{11}$ based on its negative ion HR-FABMS and showed, in the ^{1}H NMR spectrum, signals due to four methylene groups, two methoxy groups, two methine protons and five aromatic protons. In addition to the signals due to the carbons linked to the above mentioned protons, the ^{13}C NMR spectrum (Table 1) showed the presence of seven aromatic carbon atoms with no hydrogen atom, four of which have an oxygen substituent as judged from their chemical shifts, and a *β*-glucopyranosyl group. These results indicated that glochidioboside (**1**) was a glucoside of dihydrodehydrodiconiferyl alcohol. The position and mode of the glycosidic linkage were shown to be 9′-*O*-*β* by comparison with the ^{13}C NMR signals of **1**, **2** [9] and **3** [10] and from the coupling constant (J = 7.8 Hz) of the anomeric proton, respectively. Thus C-9′ resonated at *ca* 8 ppm downfield compared with those in **2** and **3** and the signals due to C-1–C-6 and C-9 resonated in essentially the same region in **2** and **3**, respectively. The relative orientation of the substituents at C-7 and C-8 was elucidated to be *trans* based on the fact that a differential NOE was observed for δ 3.75 (H_1-9) on irradiation at δ 5.49 (H-7). The absolute stereochemistriesat C-7 and C-8 were shown to be *S* and *R*, respectively, from the

*Author to whom correspondence should be addressed.



CD spectrum [positive Cotton effects at 242 nm ($\Delta\epsilon$ + 2.36) and 293 nm ($\Delta\epsilon$ + 0.99)] [11]. Thus, glochidioboside was elucidated as (7*S*,8*R*)-dihydrodehydrodiconiferyl alcohol 9′-*O*-*β*-glucoside (**1**).

EXPERIMENTAL

General

NMR: ^{1}H (400 MHz) and ^{13}C (100 MHz), TMS as int. standard; FABMS: PEG-400 as a matrix; CC: Diaion HP-20 (Mitsubishi Kasei) and silica gel 60 (230–400 mesh, Merck); TLC: silica gel 60 F_{254} (0.25 mm in thickness, Merck); prep HPLC: Cosmosil 10 C_{18}, 20 × 250 mm, solvent: MeOH-H_2O, flow rate, 6.0 ml min^{-1}, detection, 210 nm or 230 nm.

Table 1. ^{13}C NMR data for glochidioboside (**1**) and compounds **2** and **3**. (100 MHz, CD_3OD)

C	**1**	**2***	**3**†
1	134.8	136.9	134.7
2	110.6	111.2	110.8
3	149.1	147.4	149.1
4	147.5	150.7	147.5
5	116.1	117.9	116.2
6	119.7	119.3	119.8
7	89.0	89.0	89.3
8	55.4	55.5	53.0
9	65.0	65.7	72.4
1′	129.8	129.5	137.0
2′	114.2	114.1	114.4
3′	145.2	145.1	145.3
4′	147.5	147.4	147.5
5′	136.8	138.2	129.6
6′	118.0	117.9	118.2
7′	32.9	32.8	32.9
8′	32.9	35.7	35.9
9′	70.0	62.2	62.3
OMe	56.4, 56.8	56.4, 56.8	56.5, 56.9
1′	104.5		
2′	75.2		
3′	78.1‡		
4′	71.7		
5′	77.9‡		
6′	62.8		

* Data taken from Ref. [9].
† Data taken from Ref. [10].
‡ Assignments in the same vertical column may be interchanged.

Plant material

The plant material used was collected at Kunigami-son, Okinawa Prefecture, Japan in August, 1995 and identified as *Glochidion obovatum* Sieb. et Zucc. by one (A.T.) of the authors. A voucher specimen (9508-2) was deposited in the Herbarium of Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine.

Isolation

Dried leaves of *G. obovatum* (4.9 kg) were extracted with MeOH (72 l) at room temp for 3 weeks. The extraction procedure was repeated once more. The combined MeOH extract was concd *in vacuo* and the residue was dissolved in 90% MeOH (2.5 l). The soln was washed with *n*-hexane (1 l × 3) and the aq. MeOH layer was concd *in vacuo*. The residue was suspended in H_2O (1 l) and the suspension was extracted with EtOAc (1 l ×3) and *n*-BuOH (1 l ×3), successively. The *n*-BuOH layer was concd *in vacuo* to give a residue (151 g) which was chromatographed over the highly-porous synthetic resin, Dianion HP-20 (Φ = 70 mm, L = 1020 mm) with stepwise increases of MeOH in H_2O [20 (4 l), 30 (4 l), 40 (4 l), 50 (4 l) and 70 (4 l)% aq. MeOH and MeOH (4 l)]. Fractions of 500 ml being collected.

The residue (6.01 g) from frs 15–16 was subjected to silica-gel CC (250 g) with increasing amounts of MeOH in $CHCl_3$. One l-each of $CHCl_3$, $CHCl_3$–MeOH (97:3), $CHCl_3$–MeOH (19:1), $CHCl_3$–MeOH (93:7), $CHCl_3$–MeOH (9:1), $CHCl_3$–MeOH (22:3), $CHCl_3$–MeOH (17:3), $CHCl_3$–MeOH (4:1), $CHCl_3$–MeOH (3:1) and $CHCl_3$–MeOH (7:3) were passed successively through the column. The 10–12% MeOH eluate gave a residue (325.8 mg) which was separated by prep. HPLC (MeOH–H_2O 7:13) to give bergenin (27.8 mg) [7] and benzyl alcohol *β*-D-glucoside (101.0 mg) [8]. The residue (268.3 mg) from the 12% MeOH eluate was separated by prep. HPLC (MeOH–H_2O 3:7) to give dendranthemoside B (6.6 mg) [5]. The 15–20% MeOH eluate gave a residue (851.2 mg), an aliquot (200.0 mg) of which was separated by prep. HPLC (MeOH–H_2O 3:7) to

give icariside B_1 (20.0 mg) [6] and another aliquot to give bergenin (7.8 mg).

The residue (9.07 g) from frs 29–31 was subjected to silica gel CC (600 g) with increasing amounts of MeOH in $CHCl_3$. $CHCl_3$ (2 l), $CHCl_3$–MeOH (19:1, 1 l), $CHCl_3$–MeOH (9:1, 1 l), $CHCl_3$–MeOH (17:3, 3.5 l) and $CHCl_3$–MeOH (4:1, 8.6 l) were passed successively through the column, collecting 200 ml fractions. The residue (915.8 mg) from frs 32–43 was separated by silica gel CC (50 g, increasing amounts of MeOH in $CHCl_3$) and prep. HPLC (MeOH–H_2O 1:1) to give blumeol C glucoside (118.7 mg) [4]. The residue (1.12 g) from frs 44–60 was separated by silica gel CC (60 g, increasing amounts of MeOH in $CHCl_3$) followed by prep. HPLC (MeOH–H_2O 2:3) to give glochidioboside (**1**) (20.8 mg). Known compounds were identified by comparison of their spectral data (^1H and ^{13}C NMR) with those reported.

*Glochidioboside (**1**)*

Amorphous powder, $[\alpha]_D - 14.1^\circ$ (MeOH, *c* 1.03). UV λ_{max} (MeOH) nm (ϵ): 229 (13530), 282 (5730), λ_{max} (MeOH + NaOH) nm (ϵ): 243.5 (11860), 289 (5730); IR ν_{max} (dry film) cm^{-1}: 3369, 1607, 1519, 1500; ^1H NMR (CD_3OD): δ 1.90 (2H, *m*, H_2-8′), 2.67 (2H, *br.t*, J = 7.6 Hz, H_2-7′), 3.46 (1H, *m*, H-8), 3.54 (1H, *m*, H_1-9′), 3.75 (1H, *dd*, J = 10.3 and 6.8 Hz, H_1-9), 3.82 and 3.85 (each 3H, *s*; 2 × OMe), 3.92 (1H, *m*, H_1-9′), 4.25 (1H, *d*, J = 7.8 Hz, Glc-H-1), 5.49 (1H, *d*, J = 6.4 Hz, H-7), 6.74 (2H, *s*, 2′- and 6′-H_2), 6.76 (1H, *d*, J = 8.3 Hz, H-5), 6.81 (1H, *dd*, J = 8.3 and 1.5 Hz, H-6), 6.95 (1H, *d*, J = 1.5 Hz, H-2); ^{13}C NMR (CD_3OD): Table 1; CD (MeOH, *c* 3.94×10^{-5} M): $\Delta\epsilon$ (nm): + 2.36 (242), + 0.99 (293); HR-FAB-MS (negative cen-troid) *m/z*: 521.2007 $[M - H]^-$ ($C_{26}H_{33}O_{11}$ requires 521.2023).

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