# Phenylpropanoid Glycosides from *Daphne oleoides*

Nisar Ullah, Saeed Ahmad, and Abdul Malik*

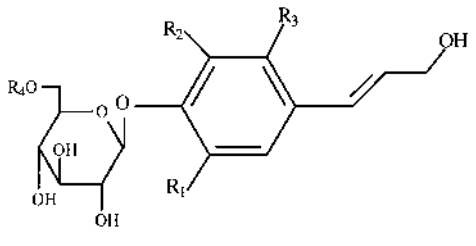
*International Centre for Chemical Sciences, H.E.J. Research Institute of Chemistry University of Karachi, Karachi-75270, Pakistan*. Received July 6, 1998; accepted September 8, 1998

**A new phenylpropanoid glucoside, daphnenoside, was isolated in addition to coniferin, conferinoside, syringin and syringinoside, from the *n*-butanol soluble fraction of *Daphne oleoides* Schreb (Thymelaeaceae). Structures were characterized on the basis of spectroscopic methods.**

**Key words** Thymelaeaceae; *Daphne oleoides*; daphnenoside; phenylpropanoid glycoside

*Daphne oleoides*, belonging to the family Thymelaeaceae, is a small multi branched shrub found in the Western Himalayas, from Garhwal Westward to Murree, occurring at an altitude of 3000 to 9000 feet.[1] The root of this plant is purgative and the bark and leaves are given in cutaneous affections. Infusion of leaves is also used in gonorrhoea and applied to abscesses.[2] As a part of our ongoing phytochemical studies on *Daphne oleoides*, we have recently reported some lignans, dimeric sesquiterpene lactones and pentacyclic triterpenes from this species.[3—5] In this paper we report the isolation and structural elucidation of a new compound daphnenoside (**1**), in addition to coniferin (**2**), conferinoside (**3**), syringin (**4**) and syringinoside (**5**) isolated for the first time from this species. The $^{13}C$ assignments of **2**, **3** and **5** are also reported for the first time in this communication.

The methanolic extract of the whole plant of *Daphne oleoides* was divided into hexane, ethyl acetate, chloroform and *n*-butanol soluble fractions. The *n*-butanol fraction was subjected to vacuum liquid chromatography (VLC) eluting with a gradient system ($CHCl_3$–MeOH) of increasing polarity to obtain fractions A, B, C, D, E and F, respectively. Fraction C (85 : 15) was further subjected to repeated column chromatography (CC) to obtain compounds (**1**—**5**). The molecular formula of compound **1** was determined as $C_{16}H_{22}O_8$ from the positive high resolution (HR) FAB-MS spectrum. The IR (KBr) spectrum showed a strong hydroxyl absorption at 3420 $cm^{-1}$. The $^1H$-NMR spectrum showed the presence of a *trans*-allylic moiety, displaying resonances at $\delta$ 6.50 (1H, dt, $J$=15.2, 1.52 Hz), 6.35 (1H, dt, $J$=15.2, 5.55 Hz) and 4.31 (2H, dd, $J$=5.55, 1.52 Hz), one methoxy group at $\delta$ 3.82 (3H, s), three aromatic protons at $\delta$ 6.88 (1H, d, $J$=8.6 Hz), 6.64 (1H, d, $J$=2.8 Hz) and 6.58 (1H, dd, $J$=2.8, 8.6 Hz). The spectrum further showed an anomeric proton signal at $\delta$ 4.72 (1H, d, $J$=7.45 Hz), indicating the presence of a sugar moiety in **1**.




**1**: $R_1$, $R_2$, $R_4$ = H; $R_3$ = OMe
**2**: $R_1$, $R_3$, $R_4$ = H; $R_2$ = OMe
**3**: $R_1$, $R_3$ = H; $R_2$ = OMe; $R_4$ = β-D-glucopyranosyl
**4**: $R_1$, $R_2$ = OMe; $R_3$, $R_4$ = H
**5**: $R_1$, $R_2$ = OMe; $R_3$ = H; $R_4$ = β-D-glucopyranosyl

The $^{13}C$-NMR and distortionless enhancement by polarization transfer (DEPT) experiments revealed the presence of ten methine, two methylene, and one methyl carbon atoms. The quaternary carbon atoms were deduced by subtracting these from the broad band (BB) spectrum. This showed resonances at $\delta$ 131.2 and 129.2, which were assigned to the double bond allylic to the aromatic moiety. Signals for sugar resonated at $\delta$ 62.70—104.2. The sugar moiety was identified as $\beta$-D-glucose by comparison with data published in the literature.[6] In the light of the above evidence, the glucose and propenol moieties were placed at the 1,4 positions leaving the possibility of a methoxy group at positions 3/5 or 2/6. Irradiation of the methoxy group at 3.82 caused a 9.6% enhancement of the signal coupled with a meta proton at $\delta$ 6.64 and irradiation of the anomeric proton at $\delta$ 4.72 caused an 8.6% enhancement of the signals at $\delta$ 6.64 and 6.58, confirming the structure of **1** as [4-(3-hydroxy-1-(*E*)-propenyl)-3-methoxyphenyl]-$\beta$-D-glucopyranoside.

## Experimental

**General Procedures** $^1H$- and $^{13}C$-NMR were measured in $CD_3OH$ and $D_2O$ on a Bruker AM 400 Spectrometer. IR (KBr) and UV (EtOH) were recorded on Shimadzu IR 460 and Hitachi U-3200 Spectrometers. Optical rotation was measured in $CH_3OH$ and $H_2O$ using JASCO DIP-360.

The whole plant of *Daphne oleoides* was collected from Hazara Division,

Table 1. $^1H$- and $^{13}C$-NMR Chemical Shift Assignment of Daphnenoside **1** ($CD_3OD$)

| #C | DEPT | $^{13}C$ | #H | $^1H$ ($J$=Hz) |
|---|---|---|---|---|
| 1 | C | 161.20 | — | — |
| 2 | CH | 97.24 | 2 | 6.64 (1H, d, $J$=2.8 Hz) |
| 3 | C | 154.44 | — | — |
| 4 | C | 118.82 | — | — |
| 5 | CH | 127.43 | 5 | 6.88 (1H, d, $J$=8.6 Hz) |
| 6 | CH | 107.60 | 6 | 6.58 (1H, dd, $J$=2.8, 8.6 Hz) |
| 7 | CH | 131.2 | 7 | 6.50 (1H, dt, $J$=1.52, 15.2 Hz) |
| 8 | CH | 129.2 | 8 | 6.35 (1H, dt, $J$=5.55, 15.2 Hz) |
| 9 | $CH_2$ | 61.85 | 9 | 4.31 (2H, dd, $J$=1.52, 5.55 Hz) |
| 1′ | CH | 104.2 | 1′ | 4.72 (1H, d, $J$=7.45 Hz) |
| 2′ | CH | 74.74 | — | — |
| 3′ | CH | 75.20 | — | — |
| 4′ | CH | 70.20 | — | — |
| 5′ | CH | 75.42 | | |
| 6′ | $CH_2$ | 62.70 | — | — |
| $OCH_3$ | $CH_3$ | 56.20 | $OCH_3$ | 3.82 (3H, s) |

* To whom correspondence should be addressed.

in February, 1995. A voucher specimen was identified by Prof. Iftikhar Hussain Shah of the Faculty of Pharmacy Gomal University, D. I. Khan, Pakistan and deposited in the Herbarium of the same University.

**Extraction and Isolation** The shade dried plant material (16 kg) was extracted thrice with methanol. The combined methanolic extract was evaporated under reduced pressure. The residue obtained was suspended in water and extracted successively with hexane, ethyl acetate, chloroform and *n*-butanol. The *n*-butanol fraction was subjected to VLC eluting with a gradient system ($CHCl_3$–MeOH) of increasing polarity to obtain fractions A, B, C, D, E and F, respectively. Fraction C, which eluted with (85 : 15) was further subjected to repeated CC, eluting with a solvent system of $CHCl_3$–MeOH to obtain daphneoside (**1**) (25 mg) (81 : 19), coniferin (**2**) (21 mg) (70.8 : 19.2), conferinoside (**3**) (23.5 mg) (74.5 : 25.5), syringin (**4**) (85 mg) (80.5 : 19.5) and syringinoside (**5**) (31 mg) (75 : 25).

Daphnenoside (**1**): Colorless crystals, mp 237 °C, $[\alpha]_D$ −18.3° ($c$=0.29, MeOH). HRFAB-MS $m/z$: 343.1320 $(M+H)^+$. $C_{16}H_{22}O_8$ requires 343.1315. UV $\lambda_{max}^{EtOH}$ nm: 260, 235. IR $\nu_{max}^{KBr}$ $cm^{-1}$: 3420 (OH), 1620 and 1520 (aromatic). $^1$H- and $^{13}$C-NMR see Table 1.

Coniferin (**2**): Needles, mp 185 °C, $[\alpha]_D$ −66.9° ($c$=1.0, MeOH). The physical and spectral data were identical with an authentic sample of coniferin.[7] $^{13}$C-NMR ($CD_3OD$): $\delta$ 143.1 (s, C-1), 144.7 (s, C-2), 114.3 (d, C-3), 132.8 (s, C-4), 120.3 (d, C-5), 117.2 (d, C-6), 131.1 (d, C-7), 129.8 (d, C-8), 62.1 (t, C-9), 103.1 (d, C-1′), 74.2 (d, C-2′), 75.1 (d, C-3′), 70.1 (d, C-4′), 75.2 (d, C-5′), 62.4 (t, C-6′), 56.3 (q, $OCH_3$).

Conferinoside (**3**): Amorphous powder, $[\alpha]_D$ −56.0° (($c$=1.0, $H_2O$). The physical and spectral data was identical with an authentic sample of conferinoside.[7] $^{13}$C-NMR ($D_2O$): $\delta$ 143.8 (s, C-1), 144.8 (s, C-2), 114.3 (d, C-3), 132.9 (s, C-4), 120.6 (d, C-5), 117.2 (d, C-6), 131.0 (d, C-7), 129.6 (d, C-8), 62.4 (t, C-9), 102.7 (d, C-1′), 74.3 (d, C-2′), 75.1 (d, C-3′), 70.2 (d, C-4′), 75.4 (d, C-5′), 66.1 (t, C-6′), 103.9 (d, C-1″), 74.8 (d, C-2″), 75.2 (d, C-3″), 70.8 (d, C-4″), 75.8 (d, C-5″), 62.9 (t, C-6″), 56.3 (q, $OCH_3$).

Syringin (**4**): Colorless needles, mp 193—194 °C, $[\alpha]_D$ −16.1° ($c$=0.11, $H_2O$). The physical and spectral data were identical with an authentic sample of syringin.[7]

Syringinoside (**5**): Colorless needles, mp 178—179 °C,$[\alpha]_D$ −37.6° ($c$=1.0, $H_2O$). The physical and spectral data were identical with an authentic sample of syringinoside.[7] $^{13}$C-NMR ($D_2O$): $\delta$ 135.6 (s, C-1), 153.8 (s, C-2), 105.3 (d, C-3), 133.9 (s, C-4), 105.3 (d, C-5), 153.8 (s, C-6), 131.2 (d, C-7), 129.2 (d, C-8), 62.5 (t, C-9), 102.4 (d, C-1′), 74.6 (d, C-2′), 75.1 (d, C-3′), 70.1 (d, C-4′), 75.4 (d, C-5′), 65.2 (t, C-6′), 103.3 (d, C-1″), 74.8 (d, C-2″), 75.7 (d, C-3″), 70.6 (d, C-4″), 75.8 (d, C-5″), 62.4 (t, C-6″), 56.4 (q, $OCH_3$).

**References and Notes**


1) Watt G., "Dictionary of the Economic Products of India," III, Cosmo Publications Delhi-6, India, 1972, p. 26.
2) Baquar S. R., "Medicinal and Poisonous Plants of Pakistan," Printas Press Karachi, Pakistan, 1989, p.161.
3) Ullah N., Anis E., Mohammad P., Rabnawaz H., Malik A., *Phytochemistry*, 1998 (in press).
4) Ullah N., Ahmed S., Mohammad P., Ahmed Z., Malik A., *Phytochemistry*, 1998 (in press).
5) Ullah N., Ahmed S., Mohammad P., Ahmed Z., Malik A., *Phytochemistry*, 1998 (in press).
6) Pfeffer P. E., Valentine K. M., Parrish F. W., *J. Am. Chem. Soc.*, **101**, 1265 (1979).
7) Niwa M., Iwadare Y., Yang-Chang W., Hirata Y., *Chem. Pharm. Bull.*, **36**, 1158 (1998).