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ZÜHAL GÜVENALP

HİLAL ÖZBEK

AYŞE KURUÜZÜM-UZ

CAVİT KAZAZ

L. ÖMÜR DEMİREZER

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## Secondary metabolites from *Nepeta heliotropifolia*

Zühal GÜVENALP<sup>1,\*</sup>, Hilal ÖZBEK<sup>1</sup>, Ayşe KURUÜZÜM-UZ<sup>2</sup>,  
Cavit KAZAZ<sup>3</sup>, L. Ömür DEMİREZER<sup>2</sup>

<sup>1</sup>Atatürk University, Faculty of Pharmacy, Department of Pharmacognosy,  
TR-25240 Erzurum-TURKEY  
e-mail: zguvenalp@atauni.edu.tr

<sup>2</sup>Hacettepe University, Faculty of Pharmacy, Department of Pharmacognosy,  
TR-06100 Ankara-TURKEY

<sup>3</sup>Atatürk University, Faculty of Arts and Sciences, Department of Chemistry,  
TR-25240 Erzurum-TURKEY

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Two iridoid glycosides, ixoroside (**1**) and nepetanudoside B (**2**); 1 phenylpropanoid glycoside, coniferine (**3**); 2 flavone glycosides, apigenin 7-*O*-glucuronide (**4**) and apigenin 7-*O*-glucopyranoside (**5**); 2 triterpenes, oleanolic acid (**6**) and ursolic acid (**7**); and 1 sterol,  $\beta$ -sitosterol (**8**), were isolated from the aerial parts of *Nepeta heliotropifolia* Lam. (Lamiaceae). Their structures were identified by means of spectroscopic methods (1D- and 2D-NMR, UV, and EIMS).

**Key Words:** Lamiaceae, *Nepeta heliotropifolia*, iridoid glycosides, flavone glycosides, triterpenoids.

### Introduction

The genus *Nepeta* (Lamiaceae) is represented by 33 species in the *Flora of Turkey*,<sup>1</sup> 17 of which are endemic. *Nepeta* species are commonly used in Turkish folk medicine as stomachics and stimulants.<sup>2</sup> Iridoids,<sup>3–7</sup> phenylethanoid<sup>8</sup> and phenylpropanoid<sup>4,9</sup> glycosides, terpenoids,<sup>6,7,10–15</sup> steroids,<sup>6,7,13</sup> lactones,<sup>6,7,16,17</sup> nepetalactams,<sup>18</sup> nepetalactols,<sup>19</sup> flavonoids,<sup>20,21</sup> phenolic acids,<sup>4,7</sup> and essential oils<sup>14</sup> were previously reported from *Nepeta* species. In the present study, we report the isolation and structure elucidation of 2 iridoid glycosides, ixoroside (**1**) and nepetanudoside B (**2**); 1 phenylpropanoid glycoside, coniferine (**3**); 2 flavone glycosides, apigenin 7-*O*-glucuronide (**4**) and apigenin 7-*O*-glucopyranoside (**5**); 2 triterpenes, oleanolic acid (**6**) and urso-

\*Corresponding author

lic acid (**7**); and 1 sterol,  $\beta$ -sitosterol (**8**), isolated from the aerial parts of *Nepeta heliotropifolia*. The structures of the compounds were elucidated by spectroscopic methods (1D- and 2D-NMR, UV, and EIMS).

## Experimental

**General experimental procedures:** The UV (MeOH) spectra were recorded on an Agilent 8453 spectrophotometer.  $^1\text{H}$ - and  $^{13}\text{C}$ -NMR spectra were recorded on a Varian Mercury plus 400 MHz for proton and 100 MHz for carbon by using TMS as internal standard. The solvents were  $\text{CDCl}_3$ ,  $\text{CD}_3\text{OD}$ , and  $\text{DMSO-d}_6$ . EIMS was performed on a Finnigan MAT 95 spectrometer. Silica gel 60 (0.063-0.200 mm, Merck) and Sephadex LH-20 (Fluka) were used for open column chromatographic separations. Lichroprep RP-18 (25-40  $\mu\text{m}$ , Merck) reversed phase material was used for vacuum liquid chromatography (VLC). TLC analyses were carried out on pre-coated Kieselgel 60 F<sub>254</sub> aluminum sheets (Merck). Compounds were detected by UV fluorescence and spraying 1% vanillin- $\text{H}_2\text{SO}_4$  reagent, followed by heating at 105 °C for 1-2 min.

**Plant material:** *Nepeta heliotropifolia* (Lamiaceae) was collected from the wetlands along the road from Ankara to Afyonkarahisar in May 2005. A voucher specimen has been deposited in the Herbarium of the Pharmacognosy Department, Faculty of Pharmacy, Hacettepe University, Ankara, Turkey (HUEF 05007).

**Extraction and pre-purification:** Open air-dried and powdered aerial parts of the plant (465 g) were extracted 3 times with MeOH at 40 °C ( $3 \times 2.5$  L). After filtration, the combined extracts were evaporated under vacuum to dryness (58 g). The residue was suspended in  $\text{H}_2\text{O}$  (150 mL) and the water soluble portion was partitioned between *n*-hexane ( $8 \times 0.5$  L),  $\text{CHCl}_3$  ( $4 \times 0.2$  L), EtOAc ( $5 \times 0.2$  L), and *n*-BuOH ( $5 \times 0.4$  L). Organic phases were condensed to dryness in vacuo. The residues obtained were 14 g, 11 g, 3 g, and 11 g, respectively.

**Isolation of the compounds:** *n*-Butanol extract (11 g) was chromatographed on a silica gel column eluting with  $\text{CHCl}_3$ -MeOH mixtures (90:10  $\rightarrow$  20:80) to yield 2 main fractions (Frs. A-B, Fr. A: 1 g, Fr. B: 5 g). Fr. A was subjected to VLC using reversed-phase material, and MeOH- $\text{H}_2\text{O}$  mixtures (0%-50%) as solvent to give Fr. A<sub>1</sub> and Fr. A<sub>2</sub>. Fr. A<sub>1</sub> was subjected to a silica gel column eluting with EtOAc-MeOH- $\text{H}_2\text{O}$  mixtures (100:17:13) to yield Fr. A<sub>1.1</sub> (29 mg) and Fr. A<sub>1.2</sub> (34 mg). Fr. A<sub>1.1</sub> gave pure compound **1** (29 mg). Purification of Fr. A<sub>1.2</sub> by Sephadex LH-20 CC using MeOH yielded compound **3** (18 mg). Fr. A<sub>2</sub> was found to be compound **2** (109 mg) in pure form. Fr. B was subjected to VLC using reversed-phase material and MeOH- $\text{H}_2\text{O}$  mixtures (0%-75%) as solvent to give Fr. B<sub>1</sub> and Fr. B<sub>2</sub>. Purification of Fr. B<sub>1</sub> by Sephadex LH-20 CC using MeOH gave compound **4** (10 mg). The EtOAc extract (3 g) was subjected to VLC on reversed-phase material using MeOH- $\text{H}_2\text{O}$  mixtures (0%-75%) to give Fr. C and Fr. D. Fr. C was eluted with MeOH from the Sephadex LH-20 column to give compound **5** (10 mg). The  $\text{CHCl}_3$  extract (11 g) was fractionated over a silica gel column with *n*-hexane-EtOAc (90:10  $\rightarrow$  40:60) mixtures to afford Fr. E and Fr. F. The former was subjected to a silica gel column eluting with *n*-hexane-EtOAc (70:30  $\rightarrow$  50:50) mixtures to yield Fr. E<sub>1</sub> (167 mg) and Fr. E<sub>2</sub>. Purification of Fr. E<sub>1</sub> by Sephadex LH-20 CC using  $\text{CHCl}_3$ -MeOH (1:1) gave a mixture of compounds **6** and **7** (60 mg). The *n*-hexane extract (14 g) was applied to repeated silica gel columns with *n*-hexane-EtOAc (90:10  $\rightarrow$  50:50) mixtures to give compound **8**.

## Results

**Ixoroside (1):** UV  $\lambda_{max}$ . (MeOH) nm: 249; IR  $\nu_{max}$ . (KBr)  $\text{cm}^{-1}$ : 3400, 1730, 1640; EIMS  $m/z$  197 [M-Glu]<sup>+</sup> (calc. for C<sub>16</sub>H<sub>24</sub>O<sub>9</sub>). <sup>13</sup>C-NMR (100 MHz, DMSO-d<sub>6</sub>) and <sup>1</sup>H-NMR (400 MHz, DMSO-d<sub>6</sub>) data are given in Table 1.

**Table 1.** Spectroscopic data of compound **1** [<sup>13</sup>C-NMR (DMSO-d<sub>6</sub>, 100 MHz) and <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>, 400 MHz)] and **2** [<sup>13</sup>C-NMR (CD<sub>3</sub>OD, 100 MHz) and <sup>1</sup>H-NMR (CD<sub>3</sub>OD, 400 MHz)].

C/H	<b>1</b>				<b>2</b>			
	DEPT	$\delta_C$	$\delta_H$	$J(\text{Hz})$	DEPT	$\delta_C$	$\delta_H$	$J(\text{Hz})$
Aglycone								
1	CH	99.6	5.38 d	2.9	CH	100.8	5.13 d	5.8
3	CH	162.6	7.40 s		CH	152.3	7.50 d	0.8
4	C	124.4			C	111.8		
5	CH	28.9	2.88 m		CH	34.5	3.03 dd	14.0/7.0
6	CH <sub>2</sub>	28.8	1.31 m 2.08 m		CH <sub>2</sub>	38.6	2.08 m 2.72 m	
7	CH <sub>2</sub>	40.9	1.43 m m 1.57 m		CH	126.8	5.48 bs	
8	C	78.3			C	139.0		
9	CH	51.1	2.22 m		CH	49.3	2.72 m	
10	CH <sub>3</sub>	25.0	1.15 s		CH <sub>3</sub>	15.1	1.84 s	
11	C	191.5	9.16 s		C	170.0		
Glucose								
1'	CH	103.2	4.45 d	8.1	CH	103.3	4.59d	7.8
2'	CH	74.3	2.90-3.35 m+		CH	74.1	3.24-3.40 m+	
3'	CH	77.3	2.90-3.35 m+		CH	77.2	3.24-3.40 m+	
4'	CH	70.3	2.90-3.35 m+		CH	70.0	3.24-3.40 m+	
5'	CH	78.0	2.90-3.35 m+		CH	77.0	3.24-3.40 m+	
6'	CH <sub>2</sub>	61.6	3.43 dd 3.63 dd	11.7/5.5 11.0/1.5	CH <sub>2</sub>	61.3	3.69 dd 3.84 dd	12.1/4.8 12.1/2.0

+: overlapped signals

**Nepetanudoside B (2):** UV  $\lambda_{max}$ . (MeOH) nm: 236; IR  $\nu_{max}$ . (KBr)  $\text{cm}^{-1}$ : 3320, 1680, 1634; EIMS  $m/z$  195 [M-Glu]<sup>+</sup> (calc. for C<sub>16</sub>H<sub>22</sub>O<sub>9</sub>). <sup>13</sup>C-NMR (100 MHz, CD<sub>3</sub>OD) and <sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD) data are given in Table 1.

**Coniferine (3):** UV  $\lambda_{max}$ . (MeOH) nm: 257; EIMS  $m/z$  179 [M-Glu]<sup>+</sup> (calc. for C<sub>16</sub>H<sub>22</sub>O<sub>8</sub>). <sup>13</sup>C-NMR (100 MHz, CD<sub>3</sub>OD) and <sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD) data are given in Table 2.

**Apigenin 7-O-glucuronide (4):** EIMS  $m/z$  269 [M-Glu]<sup>+</sup> (calc. for C<sub>21</sub>H<sub>18</sub>O<sub>11</sub>). <sup>13</sup>C-NMR (100 MHz, DMSO-d<sub>6</sub>) and <sup>1</sup>H-NMR (400 MHz, DMSO-d<sub>6</sub>) data are given in Table 3.

**Apigenin 7-O-glucopyranoside (5):** EIMS  $m/z$  269 [M-Glu]<sup>+</sup> (calc. for C<sub>21</sub>H<sub>20</sub>O<sub>10</sub>). <sup>13</sup>C-NMR (100 MHz, DMSO-d<sub>6</sub>) and <sup>1</sup>H-NMR (400 MHz, DMSO-d<sub>6</sub>) data are given in Table 3.

**Table 2.** <sup>13</sup>C-NMR (CD<sub>3</sub>OD, 100 MHz) and <sup>1</sup>H-NMR (CD<sub>3</sub>OD, 400 MHz) spectroscopic data of compound **3**.

C/H Aglycone	<b>3</b>			
	DEPT	$\delta_C$	$\delta_H$	$J(\text{Hz})$
1	C	132.5		
2	CH	110.2	7.06 d	1.8
3	C	149.6		
4	C	146.4		
5	CH	116.7	7.10 d	8.4
6	CH	119.5	6.94 dd	8.4/1.8
7	CH	130.1	6.54 d	16.1
8	CH	127.7	6.27 dt	15.8/5.6
9	CH <sub>2</sub>	62.5	4.20 dd	5.6/1.3
3-OMe	CH <sub>3</sub>	55.5	3.86 s	
Glucose				
1'	CH	101.5	4.89 d	7.8
2'	CH	73.7	3.46 m	
3'	CH	77.0	3.37 m	
4'	CH	70.1	3.37 m	
5'	CH	76.6	3.46 m	
6'	CH <sub>2</sub>	61.3	3.86 m 3.69 dd	12.0/4.8

**Oleanolic acid (6):** EIMS  $m/z$  456 [M]<sup>+</sup> (calc. for C<sub>30</sub>H<sub>48</sub>O<sub>3</sub>). <sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>):  $\delta_H$  5.24 (1H, *t*,  $J=3.6$  Hz, H-12), 3.21 (1H, *dd*,  $J=10.2/4.4$  Hz, H-3), 2.82 (1H, *dd*,  $J=12.7/4.3$  Hz, H-18), 0.96 (3H, *s*, Me-23), 0.78 (3H, *s*, Me-24), 0.84 (3H, *s*, Me-25), 0.76 (3H, *s*, Me-26), 1.25 (3H, *s*, Me-27), 0.87 (3H, *s*, Me-29), 0.93 (3H, *s*, Me-30). <sup>13</sup>C-NMR (100 MHz, CDCl<sub>3</sub>):  $\delta_C$  38.6 (C-1), 26.7 (C-2), 78.5 (C-3), 39.2 (C-4), 55.5 (C-5), 18.3 (C-6), 32.6 (C-7), 39.6 (C-8), 48.1 (C-9), 37.0 (C-10), 22.7 (C-11), 122.4 (C-12), 144.1 (C-13), 42.0 (C-14), 27.7 (C-15), 22.8 (C-16), 46.7 (C-17), 41.5 (C-18), 46.1 (C-19), 30.4 (C-20), 33.7 (C-21), 32.3 (C-22), 28.8 (C-23), 14.7 (C-24), 15.1 (C-25), 16.5 (C-26), 25.2 (C-27), 180.4 (C-28), 32.8 (C-29), 23.3 (C-30).

**Ursolic acid (7):** EIMS  $m/z$  456 [M]<sup>+</sup> (calc. for C<sub>30</sub>H<sub>48</sub>O<sub>3</sub>). <sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>):  $\delta_H$  5.28 (1H, *t*,  $J=3.6$  Hz, H-12), 3.21 (1H, *dd*,  $J=10.2/4.4$  Hz, H-3), 2.18 (1H, *d*,  $J=11.7$  Hz, H-18), 1.19 (1H, *m*, H<sub>a</sub>-22), 2.00 (1H, *dd*,  $J=13.0/4.0$  Hz, H<sub>b</sub>-22), 1.25 (3H, *s*, Me-23), 0.98 (3H, *s*, Me-24), 0.77 (3H, *s*, Me-25), 1.08 (3H, *s*, Me-26), 1.14 (3H, *s*, Me-27), 0.93 (3H, *d*,  $J=6.5$  Hz, Me-29), 0.91 (3H, *d*,  $J=5.9$  Hz, Me-30). <sup>13</sup>C-NMR (100 MHz, CDCl<sub>3</sub>):  $\delta_C$  39.2 (C-1), 27.5 (C-2), 78.5 (C-3), 38.7 (C-4), 55.5 (C-5), 18.3 (C-6), 33.1 (C-7), 39.6 (C-8), 47.8 (C-9), 36.9 (C-10), 16.6 (C-11), 125.7 (C-12), 138.4 (C-13), 41.7 (C-14), 29.5 (C-15), 24.1 (C-16), 47.7 (C-17), 53.1 (C-18), 39.2 (C-19), 39.2 (C-20), 30.5 (C-21), 36.9 (C-22), 28.0 (C-23), 15.2 (C-24), 14.8 (C-25), 16.4 (C-26), 23.1 (C-27), 180.4 (C-28), 22.9 (C-29), 22.8 (C-30).

**Table 3.** <sup>13</sup>C-NMR (DMSO-d<sub>6</sub>, 100 MHz) and <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>, 400 MHz) spectroscopic data of compounds 4 and 5.

C/H Aglycone	4				5			
	DEPT	$\delta_C$	$\delta_H$	$J(\text{Hz})$	DEPT	$\delta_C$	$\delta_H$	$J(\text{Hz})$
2	C	164.9			C	165.0		
3	CH	103.5	6.80 s		CH	103.6	6.84 s	
4	C	182.6			C	182.6		
5	C	162.4			C	162.5		
6	CH	100.2	6.42 d	1.8	CH	100.1	6.42 d	2.2
7	C	163.7			C	163.6		
8	CH	95.3	6.77 d	1.8	CH	95.5	6.81 d	2.2
9	C	157.6			C	157.6		
10	C	105.9			C	106.0		
1'	C	121.3			C	121.3		
2'	CH	129.4	7.87 d	8.8	CH	129.3	7.93 d	9.1
3'	CH	116.7	6.88 d	8.8	CH	116.7	6.90 d	8.8
4'	C	161.7			C	161.7		
5'	CH	116.7	6.88 d	8.8	CH	116.7	6.90 d	8.8
6'	CH	129.4	7.87 d	8.8	CH	129.3	7.93 d	9.1
Glucuronic acid					Glucose			
1''	CH	100.3	5.05 d	7.3	CH	100.5	5.05 d	7.3
2''	CH	73.6	3.13-3.40 m+		CH	73.7	3.14-3.39 m+	
3''	CH	77.2	3.13-3.40 m+		CH	77.8	3.14-3.39 m+	
4''	CH	72.6	3.13-3.40 m+		CH	70.2	3.14-3.39 m+	
5''	CH	74.4	3.61 d	10.3	CH	77.1	3.14-3.39 m+	
6''	C	172.6			CH <sub>2</sub>	61.2	3.55 dd 3.73 dd	11.9/6.2 11.6/1.8

+: overlapped signals

**$\beta$ -sitosterol (8):** EIMS  $m/z$  414 [M]<sup>+</sup> (calc. for C<sub>29</sub>H<sub>50</sub>O). <sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>):  $\delta_H$  3.52 (1H, *m*, H-3), 2.25 (2H, *m*, H-4), 5.35 (1H, *m*, H-6), 0.69 (3H, *s*, Me-18), 1.01 (3H, *s*, Me-19), 0.92 (3H, *d*,  $J=6.4$  Hz, Me-21), 0.83 (3H, *d*,  $J=6.8$  Hz, Me-26), 0.81 (3H, *d*,  $J=6.9$  Hz, Me-27), 0.85 (3H, *t*,  $J=7.8$  Hz, Me-29). <sup>13</sup>C-NMR (100 MHz, CDCl<sub>3</sub>):  $\delta_C$  37.4 (C-1), 31.8 (C-2), 72.0 (C-3), 42.5 (C-4), 140.9 (C-5), 121.9 (C-6), 32.1 (C-7), 32.1 (C-8), 50.3 (C-9), 36.7 (C-10), 21.3 (C-11), 39.9 (C-12), 42.5 (C-13), 56.9 (C-14), 24.5 (C-15), 28.4 (C-16), 56.2 (C-17), 12.0 (C-18), 19.6 (C-19), 36.3 (C-20), 19.0 (C-21), 34.1 (C-22), 26.2 (C-23), 46.0 (C-24), 29.3 (C-25), 20.0 (C-26), 19.2 (C-27), 23.2 (C-28), 12.2 (C-29).

## Discussion

The methanol extract of the aerial parts of *Nepeta heliotropifolia* was suspended in water and extracted with *n*-hexane, CHCl<sub>3</sub>, EtOAc, and *n*-BuOH, consecutively. From these extracts 8 known compounds were

isolated by various chromatographic techniques: 2 iridoid glycosides, ixoroside (**1**) and nepetanudoside B (**2**); 1 phenylpropanoid glycoside, coniferine (**3**); 2 flavone glycosides, apigenin 7-*O*-glucuronide (**4**) and apigenin 7-*O*-glucopyranoside (**5**); 2 triterpenes, oleanolic acid (**6**) and ursolic acid (**7**); and 1 sterol,  $\beta$ -sitosterol (**8**) (Figures 1 and 2). The structures of the isolated compounds were elucidated by 1D- and 2D-NMR (HMBC, HMQC and NOESY), UV, and EIMS.

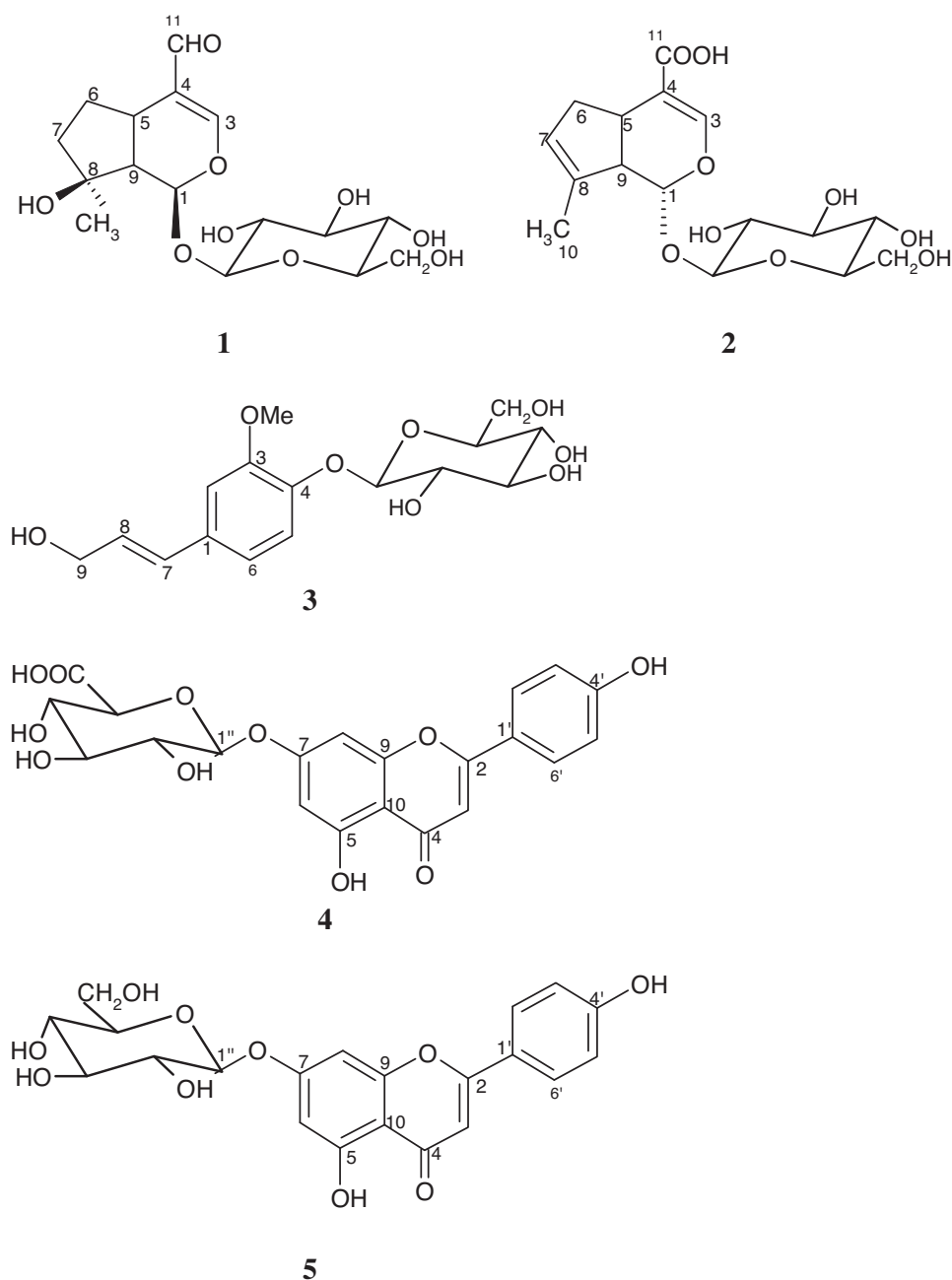
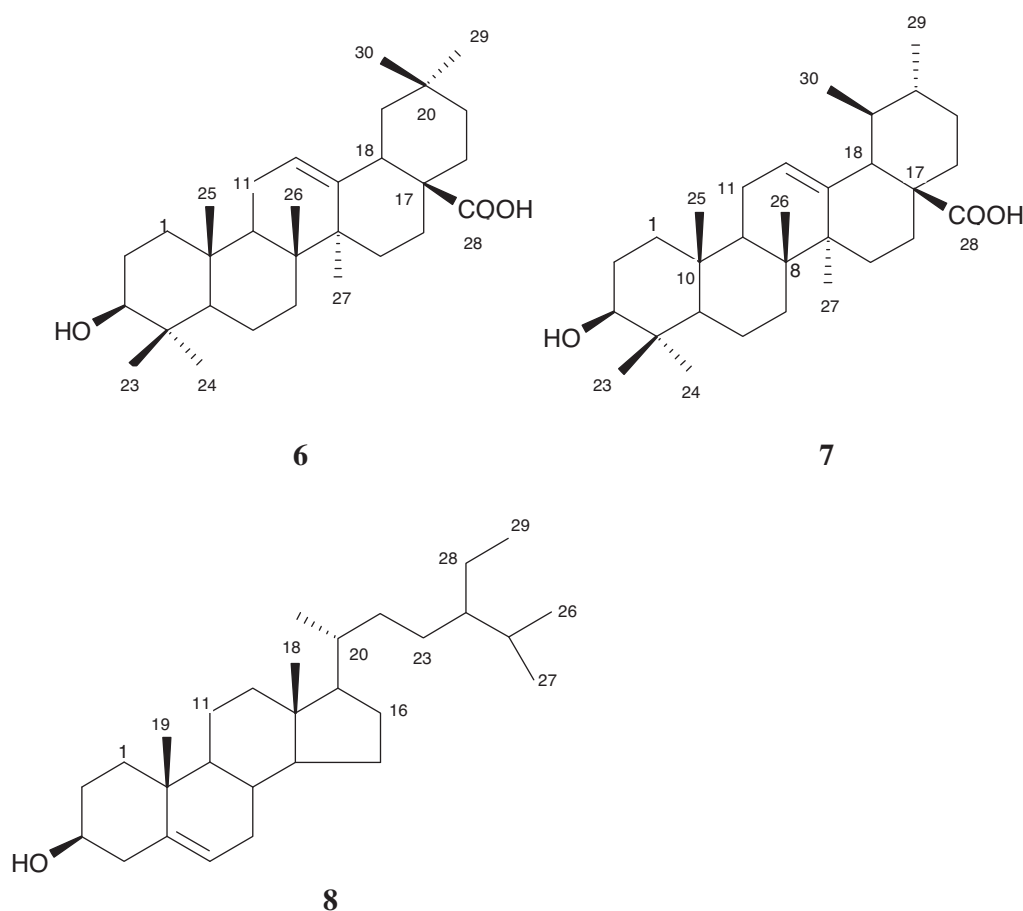


Figure 1. Isolated compounds (1-5) from *Nepeta heliotropifolia*.



**Figure 2.** Isolated compounds (**6-8**) from *Nepeta heliotropifolia*.

The UV and IR spectra of compounds **1** and **2** showed the presence of a conjugated enol-ether system. The  $^1\text{H-NMR}$  spectrum of compound **1** contained signals due to an acetal proton ( $\delta_H$  5.38), an olefinic proton ( $\delta_H$  7.40), an  $\alpha,\beta$ -unsaturated aldehyde proton ( $\delta_H$  9.16), 2 methines ( $\delta_H$  2.22, 2.88), 2 methylenes ( $\delta_H$  1.31 and 2.08;  $\delta_H$  1.43 and 1.57), and a tertiary methyl proton ( $\delta_H$  1.15). Additional signals in the region of  $\delta_H$  2.90 and 3.63 (6H) accompanied by an anomeric proton resonance at  $\delta_H$  4.45 (d,  $J=8.1$  Hz) showed that compound **1** contained a  $\beta$ -glucopyranosyl unit. The  $^{13}\text{C-NMR}$  spectrum of compound **1** displayed 16 signals, 6 of which could be attributed to a  $\beta$ -glucopyranosyl unit and 10 of which were ascribed to a cyclopentanopyran ring system. The connectivities of the molecular fragments were established by a hetero-nuclear multiple-bond correlation experiment (HMBC). On the other hand, the chemical shift values of C-8 and H<sub>3</sub>-10 indicated the presence of a tertiary hydroxyl group at the C-8 position. Based on the spectral data, compound **1** was established as ixoroside.<sup>22</sup>

The  $^1\text{H-NMR}$  spectrum of compound **2** showed signals due to an acetal proton ( $\delta_H$  5.13), 2 olefinic protons ( $\delta_H$  7.50, 5.48), 2 methines ( $\delta_H$  2.72, 3.03), 1 methylene proton ( $\delta_H$  2.08 and 2.72), and 1 methyl proton ( $\delta_H$  1.84). In addition, the presence of signals at  $\delta_H$  3.24, 3.84 (6H) and  $\delta_H$  4.59 (d,  $J=7.8$  Hz) were consistent with a  $\beta$ -glucopyranosyl unit. The  $^{13}\text{C-NMR}$  spectrum of compound **2** was almost identical to that of **1** and exhibited characteristic signals for an iridoid structure with a 10-carbon skeleton and a  $\beta$ -glucopyranosyl



unit. According to its NMR data and a comparison with those given in the literature, the structure of **2** was established as nepetanudoside B.<sup>5</sup>

Compound **3** was obtained as an amorphous powder. The <sup>1</sup>H-NMR spectrum of compound **3** showed signals due to 3 aromatic protons ( $\delta_H$  6.94, 7.06, and 7.10), 2 olefinic protons ( $\delta_H$  6.27, 6.54), 1 methylene proton ( $\delta_H$  4.20), and 1 methoxyl proton ( $\delta_H$  3.86). In addition, the presence of signals at  $\delta_H$  3.37, 3.69 (6H) and  $\delta_H$  4.89 (d,  $J = 7.8$  Hz) were consistent with a  $\beta$ -glucopyranosyl unit. The <sup>13</sup>C-NMR spectrum of compound **3** displayed 16 signals, 6 of which could be attributed to a  $\beta$ -glucopyranosyl unit and 1 to a methoxyl unit, while 9 were ascribed to a phenylpropanoid system. The connectivities of the molecular fragments were established by a hetero-nuclear multiple-bond correlation experiment (HMBC). According to its NMR data and a comparison with those given in the literature, the structure of **3** was established as coniferine.<sup>23,24</sup>

Compounds **4** and **5** were obtained as a yellowish powder. Their structures were identified as apigenin 7-*O*-glucuronide<sup>25,26</sup> and apigenin 7-*O*-glucopyranoside,<sup>27</sup> respectively, by comparing their <sup>1</sup>H- and <sup>13</sup>C-NMR data with previously published data and by direct comparison with the authentic samples on a TLC plate.

Compounds **6**, **7**, and **8** were obtained as a white powder. Their structures were identified as oleanolic acid<sup>28</sup>, ursolic acid,<sup>29</sup> and  $\beta$ -sitosterol,<sup>30</sup> respectively, by comparing their <sup>1</sup>H- and <sup>13</sup>C-NMR data with previously published data.

To our knowledge, nepetanudoside B,<sup>5</sup> apigenin 7-*O*-glucuronide,<sup>21</sup> apigenin 7-*O*-glucopyranoside,<sup>21</sup> oleanolic acid,<sup>6,7,11,15</sup> ursolic acid,<sup>6,7,11,15</sup> and  $\beta$ -sitosterol<sup>6,7,11</sup> have been reported from different *Nepeta* species. This study is the first report on the isolation and structure elucidation of coniferin from *Nepeta* species and ixoroside from the family Lamiaceae.

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