BIOACTIVE ISOCOUMARINS FROM *CISSUS PTEROCLADA*

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(Received 09th September 2011, accepted 09th April 2012)

Investigation of the roots with stems of *Cissus pteroclada* Hayata resulted in isolation of fourteen compounds including five isocoumarins, bergenin (**1**), norbergenin (**2**), 6-*O*-galloylbergenin (**3**), 6-*O*-(4-hydroxy benzoyl) bergenin (**4**), and 6-*O*-galloylnorbergenin (**5**). The structures of the isolated compounds were identified by spectroscopic analyses and comparison of their spectral data with those in literature. Compounds **1**, **3**, **5** were evaluated for anti-inflammatory activity. Both **3** and **5** showed potent inhibitory effect on superoxide anion generation with IC_{50} values of 1.94 ± 0.33 and 4.08 ± 0.49 μM, respectively.

Key words: *Cissus pteroclada* Hayata, Vitaceae, isocoumarin, anti-inflammatory, superoxide anion

Introduction

Cissus pteroclada Hayata (*Vitis pteroclada* Hayata, *Cissus hastate* (Miq.) Planch,[1,2] Vitaceae) is the original plant of a traditional Chinese "Sifang-teng".[3] The stems of this plant is traditionally used to treat rheumatism, cramp, contuse, and bruise.[3,4] *C. pteroclada* has been one of our studied plants in the family Vitaceae. Previously, we isolated several resveratrol derivatives from the roots of *Vitis thunbergii* Sieb. & Zucc.,[5,6] and they showed significant antiplatelet, antioxidative, antiinflammatory, and H1N1-stimulated RANTES secretion inhibitory activities.[7-10] The plants of genus *Cissus* have been reported to contain multiple classes of constituents. Among them, *C sicyoides* (CS) is distributed throughout the tropics, mainly in Brazil and Caribbean, it is used as a diuretic, anti-inflammator, and antidiabetic. The extract of CS presented a vasoconstrictor effect on guinea-pig aorta rings and an anticonvulsant activity.[11] Phytochemical studies of this plant, abundant constituents including coumarins, flavonoids, anthocyanins, stilbenes, lignans, and alkaloids were isolated.[12] *C quadrangularis* (CQ) is widely distributed in India and used as an osteoprotective agent in Ayurveda, the Indian system of alternative medicine. The petroleum ether extract of this plant showed anti-osteoporotic activity

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in rats.[13] The constituents isolated from CQ included triterpenoids, steroids, stilbenes, flavonoids, lipids, and iridoids.[14] The root of *C. repens* L. is traditionally used to treat carbuncle, furuncle, cystitis, and gonorrhea in Taiwan. It was reported to contain stilbenes, lignans, and triterpenes.[15,16] Previously, we investigated the constituents of this material, and several stilbenes were obtained.[17] Earlier, Chi et al reported the isolation of six compounds from the stems of *C. pteroclada*, including three isocoumarins, bergenin (**1**), 6-*O*-galloylbergenin (**3**), and 6-*O*-(4-hydroxy benzoyl) bergenin (**4**).[3] In our investigation of the constituents of this plant, five isocoumarins along with nine other compounds were obtained. Except for three isocoumarins mentioned above and gallic acid, norbergenin (**2**) and 6-*O*-galloylnorbergenin (**5**) with other eight compounds were isolated from this plant for the first time. Among these compounds, isocoumarins **1, 3**, **5** were tested for anti-inflammatory activity.

Materials and Methods

I. General experimental procedures

Mass spectra were recorded with a Finnigan DSQ II MS spectrometer (ESI-MS). ^{1}H, ^{13}C, and 2D NMR spectra were measured with a Varian Unity Inova 500 MHz FT-NMR spectrometer.

II. Plant material

The roots with stems of *C. pteroclada* were collected from Hsin Chu county, Taiwan in August, 2008 and identified by a taxonomist, Mr. Jun-Chih Ou. A voucher specimen (NHP-01476) is deposited at the Herbarium of National Research Institute of Chinese Medicine, Republic of China.

III. Extraction and isolation

The air-dried roots with stems of *C. pteroclada* (8.37 kg) were extracted at 50°C with ethanol (160 L×3, 24 h each). After evaporation of the solvent in vacuo, the concentrated EtOH extract (576.76 g) was treated with CH_2Cl_2–Me_2CO/1:1 to give CH_2Cl_2–Me_2CO/1:1-soluble (29.70 g) and CH_2Cl_2–Me_2CO/1:1-insoluble (547.06 g) portions. The CH_2Cl_2–Me_2CO/1:1 soluble portion was subjected to a silica gel column (70-230 mesh, 10 × 45 cm) eluting with gradient solvent systems of CH_2Cl_2–Me_2CO (20:1 to 0:1) and MeOH to yield 65 fractions (3 L each). From fraction 4, CH_2Cl_2–Me_2CO = 20:1 eluate, the insoluble portion in *n*-hexane was purified by a silica gel column eluting with *n*-hexane–Me_2CO (25:1) to get taraxerol (3.2 mg) and taraxerone (5.3 mg). Fractions 21-22, CH_2Cl_2–Me_2CO = 10:2 eluate, was further separated over a silica gel column eluting with CH_2Cl_2–Me_2CO (20:1) to yield betulinic acid (8.3 mg). From fractions 23-29, CH_2Cl_2–Me_2CO = 10:3 eluate, the insoluble portion in CH_2Cl_2 was purified over a silica gel column eluting with CH_2Cl_2–Me_2CO (10:1) to obtain ursolic acid (34.5 mg). Reseparation of fractions 50-53, CH_2Cl_2–Me_2CO = 10:10 eluate, through a Sephadex LH-20 column with MeOH–H_2O (3:1, 1:0) and a MPLC column [Lichroprep RP-18, 40-63 μm, 2 × (2.5 × 31 cm); Merck] with H_2O–MeOH/90:10 to 60: 40 (v/v, flow rate: 2.0 mL/min) to give 6-*O*-(4-hydroxy benzoyl) bergenin (**4**, 3.2 mg, purity 95.9%) and methyl caffeate (2.8 mg). Fractions 54-55, CH_2Cl_2–Me_2CO = 10:15 eluate, was purified through a Sephadex LH-20 column (MeOH–H_2O, 3:1 to 1:0) to give bergenin (**1**, 3.38 g, purity 99.8%) and mixture A which was further purified over a MPLC column (RP-18) eluting with H_2O-MeOH/60:40 and then

through recrystallization (MeOH/H_2O) to afford 6-*O*-galloylbergenin (**3**, 96.09 mg, purity 99.2%). Using the same chromatographic methods as fractions 50-53 to treat fractions 57-58 (CH_2Cl_2–Me_2CO = 10:30 eluate), (+)-(2*S*,3*R*)-gallocatechin (4.6 mg), 1,6-di-*O*-galloyl-β-D-glucoside (3.1 mg), myricetrin (16.8 mg), 6-*O*-galloylnorbergenin (**5**, 138.1 mg, purity 97.0%), and norbergenin (**2**, 3.5 mg, purity 96.8%) were isolated. Moreover, the CH_2Cl_2–Me_2CO/1:1-insoluble portion was suspended in MeOH, and the soluble portion (445.42 g) was subjected to a Sephadex LH-20 column (MeOH–H_2O, 3:1 , 5:1, 1:0) to afford 40 fractions (1 L each). Then fractions 15-18, MeOH–H_2O = 3:1 eluate, was repeatedly purified over MPLC columns (RP-18) eluting with H_2O-MeOH/90:10 to 60: 40 to yield gallic acid (255.6 mg) and 6-*O*-galloylnorbergenin (30.3 mg).

IV. Bergenin (1)

White powder; UV (CH_3OH) λ_{max} (log ε): 317 (3.44), 245 (3.91), 218 (4.42) nm; IR (KBr) ν_{max} cm^{-1}: 3394 (OH), 1703 (C=O), 1616, 1465, 1346, 1231, 1093, 855; ^{1}H NMR (DMSO-d_6, 500 MHz) δ 3.18 (1H, m, H-4'), 3.42 (1H, m, H-6'a), 3.55 (1H, t, *J* = 8.0 Hz, H-5'), 3.63 (1H, m, H-3'), 3.76 (3H, s, 4-OCH_3), 3.83 (1H, br d, *J* = 9.5 Hz, H-6'b), 3.99 (1H, m, H-2'), 4.88 (1H, t, *J* = 5.5 Hz, 6'-OH), 4.96 (1H, d, *J* = 10.5 Hz, H-1'), 5.40 (1H, d, *J* = 6.0 Hz, 4'-OH), 5.61 (1H, d, *J* = 5.5 Hz, 3'-OH), 6.98 (1H, s, H-6), 8.43 (1H, s, 3-OH), 9.73 (1H, s, 5-OH); ^{1}H NMR (CD_3OD, 500 MHz) δ 3.44 (1H, t, *J* = 9.0 Hz, H-4'), 3.66 (1H, m, H-5'), 3.71 (1H, m, Hx-6'), 3.81 (1H, t, *J* = 9.0 Hz, H-3'), 3.88 (3H, s, 4-OCH_3), 4.01 (1H, br d, *J* = 10.5 Hz, Hy-6'), 4.06 (1H, t, *J* = 10.0 Hz, H-2'), 4.93 (1H, d, *J* = 10.5 Hz, H-1'), 7.06 (1H, s, H-6); ^{13}C NMR (DMSO-d_6, 125 MHz) δ 59.8 (4-OCH_3), 61.1 (C-6'), 70.6 (C-4'), 72.0 (C-1'), 73.6 (C-3'), 79.7 (C-2'), 81.7 (C-5'), 109.4 (C-6), 115.9 (C-2), 118.0 (C-1), 140.5 (C-4), 148.0 (C-3), 150.9 (C-5), 163.3 (C-7); ESIMS *m/z* 327 $[M–H]^-$ ($C_{14}H_{16}O_9$).

V. Norbergenin (2)

Brown yellow powder; UV (CH_3OH) λ_{max} (log ε): 289 (1.06), 221 (4.42) nm; IR (KBr) ν_{max} cm^{-1}: 3391 (OH), 1704 (C=O), 1622, 1479, 1348, 1234, 1091, 870; ^{1}H NMR (CD_3OD, 500 MHz) δ 3.43 (1H, t, *J* = 9.0 Hz, H-4'), 3.66 (1H, m, H-5'), 3.69 (1H, m, H-6'a), 3.80 (1H, t, *J* = 9.0 Hz, H-3'), 4.01 (1H, br d, *J* = 10.5 Hz, H-6'b), 4.02 (1H, t, *J* = 10.0 Hz, H-2'), 4.93 (1H, d, *J* = 10.5 Hz, H-1'), 7.06 (1H, s, H-6); ^{13}C NMR (CD_3OD, 125 MHz) δ 62.7 (C-6'), 71.9 (C-4'), 74.3 (C-1'), 75.6 (C-3'), 81.3 (C-2'), 82.9 (C-5'), 111.0 (C-6), 114.2 (C-1), 117.3 (C-2), 141.2 (C-4), 143.6 (C-3), 147.2 (C-5), 166.4 (C-7); ESIMS *m/z* 313 $[M–H]^-$ ($C_{13}H_{14}O_9$).

VI. 6-*O*-galloylbergenin (3)

White powder; UV (CH_3OH) λ_{max} (log ε): 276 (4.52), 219 (4.86) nm; IR (KBr) ν_{max} cm^{-1}: 3366 (OH), 1732, 1699 (C=O), 1618, , 1520, 1467, 1352, 1225, 1095, 870; ^{1}H NMR (CD_3OD, 500 MHz) δ 3.54 (1H, dd, *J* = 9.0, 10.0 Hz, H-4'), 3.84 (1H, t, *J* = 9.0 Hz, H-3'), 3.89 (3H, s, 4-OCH_3), 3.95 (1H, m, H-5'), 4.10 (1H, dd, *J* = 9.0, 10.5 Hz, H-2'), 4.38 (1H, dd, *J* = 7.0, 12.0 Hz, H-6'a), 4.82 (1H, br d, *J* = 12.0 Hz, H-6'b), 5.02 (1H, d, *J* = 10.5 Hz, H-1'), 7.09 (1H, s, H-6), 7.10 (2H, s, H-9, 13); ^{13}C NMR (CD_3OD, 125 MHz) δ 61.0 (4-OCH_3), 64.6 (C-6'), 71.8 (C-4'), 74.4 (C-1'), 75.5 (C-3'), 80.7 (C-5'), 81.3 (C-2'), 110.3 (C-9, 13), 111.2 (C-6), 117.0 (C-1), 119.5 (C-2), 121.0 (C-8), 140.1 (C-11), 142.3 (C-4), 146.6 (C-10, 12), 149.3

(C-3), 152.4 (C-5), 165.7 (C-7), 168.2 (C-14); ESIMS *m/z* 479 $[M–H]^-$ ($C_{21}H_{20}O_{13}$).

VII. 6-*O*-(4-hydroxy benzoyl) bergenin (4)

Brown yellow powder; UV (CH_3OH) λ_{max} (log ε): 262 (4.20), 215 (4.50) nm; IR (KBr) ν_{max} cm^{-1}: 3367 (OH), 1708 (C=O), 1610, 1519, 1458, 1352, 1238, 1099, 854; ^{1}H NMR (CD_3OD, 500 MHz) δ 3.53 (1H, t, *J* = 9.0 Hz, H-4'), 3.83 (1H, t, *J* = 9.0 Hz H-3'), 3.87 (3H, s, 4-OCH_3), 3.95 (1H, m, H-5'), 4.09 (1H, t, *J* = 10.0 Hz, H-2'), 4.35 (1H, dd, *J* = 7.0, 12.0 Hz, H-6'a), 4.89 (1H, br d, *J* = 12.0 Hz H-6'b), 5.00 (1H, d, *J* = 10.5 Hz, H-1'), 6.82 (2H, d, *J* = 8.5 Hz, H-10, 12) , 7.06 (1H, s, H-6), 7.91 (2H, d, *J* = 8.5 Hz, H-9, 13); ^{13}C NMR (CD_3OD, 125 MHz) δ 61.0 (4-OCH_3), 64.8 (C-6'), 72.0 (C-4'), 74.3 (C-1'), 75.4 (C-3'), 80.6 (C-5'), 81.2 (C-2'), 111.2 (C-6), 116.2 (C-10, 12), 117.0 (C-2), 119.4 (C-1), 121.8 (C-8), 133.0 (C-9, 13), 142.2 (C-4), 149.3 (C-3), 152.3 (C-5), 163.7 (C-11), 165.6 (C-7), 167.9 (C-14); ESIMS *m/z* 447 $[M–H]^-$ ($C_{21}H_{20}O_{11}$).

VIII. 6-*O*-galloylnorbergenin (5)

Brown yellow powder; UV (CH_3OH) λ_{max} (log ε): 282 (4.15), 217 (4.58) nm; IR (KBr) ν_{max} cm^{-1}: 3383 (OH), 1712 (C=O), 1622, 1536, 1450, 1352, 1234, 1087, 870; ^{1}H NMR (CD_3OD, 500 MHz) δ 3.52 (1H, t, *J* = 9.0 Hz, H-4'), 3.84 (1H, t, *J* = 9.0 Hz, H-3'), 3.94 (1H, m, H-5'), 4.07 (1H, t, *J* = 9.0 Hz, H-2'), 4.36 (1H, dd, *J* = 7.0, 12.0 Hz, H-6'a), 4.82 (1H, br d, *J* = 12.0 Hz, H-6'b), 5.02 (1H, d, *J* = 10.5 Hz, H-1'), 7.08 (1H, s, H-6), 7.09 (2H, s, H-9, 13); ^{13}C NMR (CD_3OD, 125 MHz) δ 64.8 (C-6'), 71.9 (C-4'), 74.5 (C-1'), 75.5 (C-3'), 80.6 (C-5'), 81.3 (C-2'), 110.2 (C-9, 13), 111.1 (C-6), 114.3 (C-1), 117.0 (C-2), 121.0 (C-8), 140.1 (C-11), 141.2 (C-4), 143.5 (C-3), 146.5 (C-10, 12), 147.4 (C-5), 166.3 (C-7), 168.1 (C-14); ESIMS *m/z* 465 $[M–H]^-$ ($C_{20}H_{18}O_{13}$).

IX. Anti-inflammatory activity

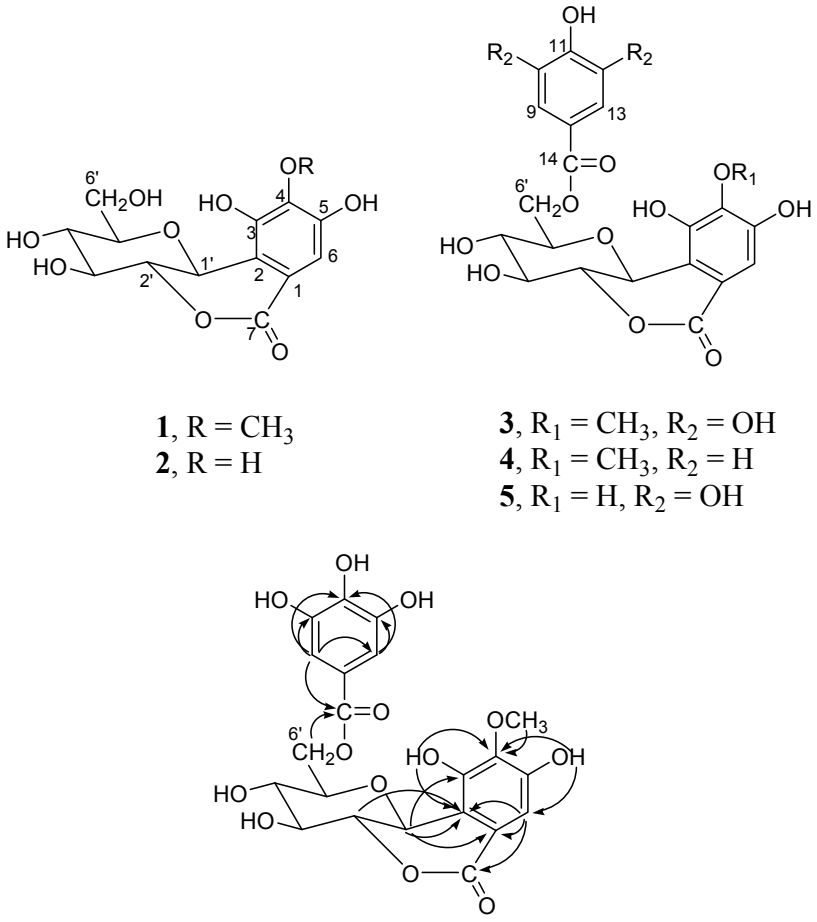
The isocoumarins **1**, **3**, **5** were assayed for anti-inflammatory activity based on effects against superoxide anion generation and elastase release by human neutrophils in response to fMLP/CB. The measurement of superoxide anion generation and elastase release by human neutrophils were assayed with the method described previously.[18,19] The purities of compounds **1**, **3**, **5** determined by NMR method gave 99.8%, 99.2%, and 97.0%, respectively.

Results and Discussion

An ethanolic extract of the roots with stems of *C. pteroclada* was repeatedly chromatographed on silica gel and Sephadex LH-20 to afford fourteen compounds including five isocoumarins, bergenin (**1**),[3,20] norbergenin (**2**),[3,20] 6-*O*-galloylbergenin (**3**),[3,21] 6-*O*-(4-hydroxy benzoyl) bergenin (**4**),[3] and 6-*O*-galloylnorbergenin (**5**),[21] along with taraxerol,[22] taraxerone,[22] betulinic acid,[23] ursolic acids,[23] gallic acid, (+)-(2*S*,3*R*)-gallocatechin,[24] 1,6-di-*O*-galloyl-β-D-glucoside,[25] methyl caffeate,[26] and myricetrin.[27]

Compound **1** was obtained as white powder, and its molecular formula was determined to be $C_{14}H_{16}O_9$ by ESIMS ($[M–H]^-$ 327) and NMR data. One aromatic methoxy and one ester carbonyl signals were observed at δ 59.8 and 163.3, respectively, in the ^{13}C spectrum of **1**. Other twelve signals were attributed to the carbons of one set of six-membered sugar and one aromatic ring. In the ^{1}H NMR spectrum , the signals at δ 3.18 (1H, m, H-4'), 3.42 (1H, m, H-6'a), 3.55 (1H, t, *J* = 8.0 Hz,, H-5'), 3.63 (1H, m,

H-3'), 3.83 (1H, br d, J = 9.5 Hz, H-6'b), 3.99 (1H, m, H-2'), and 4.96 (1H, d, J = 10.5 Hz, H-1') were attributed to one β-glucosyl moiety. The positions of these protons were assigned based on their ^{1}H-^{1}H COSY correlations. The remaining two singlets were due to one methoxy group (δ 3.76) and one aromatic proton (δ 6.98). In the HMBC spectrum of **1** (Fig. 1), the anomeric proton signal (δ 4.96) existed correlations with the signals of one oxygenated aromatic carbon at δ 148.0 (C-3) and two aromatic tertiary carbons at δ 118.0 (C-1) and 115.9 (C-2) which also correlated to H-2' signal, suggesting that the sugar moiety was C-C linked at C-2 of the aromatic ring through anomeric carbon. The proton signal at δ 6.98 showed correlations with the signals of C-1, C-2, and carbonyl signal (δ 163.3), which resulted in assignment of this proton to H-6. In addition, the signals of two hydroxys at δ 8.43 (3-OH) and 9.73 (5-OH) existed correlations with the signals of C-2 and C-6 (δ 109.4), respectively, and another carbon (δ 140.5) that was thus assigned to C-4 which also correlated to the methoxy protons. Therefore, this methoxy group was judged to be at C-4. Since the proton signals of other three hydroxys were observed at δ 4.88 (6'-OH), 5.40 (4'-OH), and 5.61 (3'-OH) which were assigned based on their ^{1}H-^{1}H COSY correlations, and the signal of H-2' appeared at lower field than those of other sugar protons except H-1'. This suggested the linkage of C-2'



1, R = CH_3
2, R = H

3, R_1 = CH_3, R_2 = OH
4, R_1 = CH_3, R_2 = H
5, R_1 = H, R_2 = OH

Fig. 1. HMBC correlations of 1 and 3.

to C-1 through an ester group, which was supported by the molecular weight of **1**. According to the above spectral analyses, and comparison of these data with those in literature,[3,20] compound **1** was identified as bergenin.

Compound **2** was obtained as brown yellow powder and had a molecular formula of $C_{13}H_{14}O_9$ ([M –H]$^-$ 313) that differed by a CH_2 moiety from **1**. Its ^{1}H and ^{13}C NMR spectra as well as 2D NMR crrelations were closely similar to those of **1**, except for the absence of one methoxy signal. Comparison of the spectral data of **2** with those in literature,[3,20] this compound was identified as norbergenin.

Compound **3**, $C_{21}H_{20}O_{13}$ [M–H]$^-$ 479, was obtained as white powder. The spectral characteristics of compound **3** showed it was a derivative of bergenin (**1**). The ^{13}C and DEPT NMR spectra displayed the presence of nineteen signals for twenty-one carbons including one aromatic methoxy (δ 61.0) and two ester carbonyl carbons (δ 165.7, 168.2). In the ^{1}H NMR spectrum of **3**, in addition to the signals of bergenin portion, one symmetric AA'-type singlet at δ 7.10 (H-9, 13) were displayed. This signal existed HMBC correlations (Fig. 1) with the signals of its HMQC correlated carbon at δ 110.3 (C-9, 13), three oxygenated carbons at δ 140.1 (C-11) and 146.6 (C-10, 12), and the carbonyl carbon at δ 168.2 (C-14), which indicated the presence of one galloyl substitute that was suggested to link at C-6' of the glucosyl moiety based on the correlation between H_2-6' (δ 4.38, 4.82) and C-14. According to the above evidence and comparison of the spectral data of **3** with those in literature,[3,21] this compound was identified as 6-*O*-galloylbergenin.

Compound **4**, brown yellow powder, was also a derivative of bergenin and had a molecular formula of $C_{21}H_{20}O_{11}$ ([M–H]$^-$ 447) that was two oxygen less than that of **3**. In the ^{1}H NMR spectrum of **4**, the signals due to a set of A_2X_2 type aromatic protons appeared at δ 6.82 (2H, d, J = 8.5 Hz, H-10, 12) and 7.91 (2H, d, J = 8.5 Hz, H-9, 13) which existed HMBC correlation (Fig. 1) with the carbonyl carbon at δ 167.9 (C-14). In addition, correlations between H_2-6' (δ 4.35, 4.89) and C-14 were also displayed. Accordingly, compound **4** was identified as 6-*O*-(4-hydroxy benzoyl) bergenin.[3] Compound **5** was obtained as brown yellow powder and had a molecular formula of $C_{20}H_{18}O_{13}$ ([M–H]$^-$ 465) that differed by a CH_2 moiety from **3**. Its ^{1}H and ^{13}C NMR spectra as well as 2D NMR crrelations were closely similar to those of **3**, except for the absence of one methoxy signal. Compound **5** was thus identified as

Table 1. Effects of compounds on superoxide anion generation and elastase release by human neutrophils in response to FMLP/CB.

Compounds	Superoxide anion	Elastase release	
	IC_{50} (μM)[a] or (Inh %)[b]	IC_{50} (μM) or (Inh %)	
bergenin (**1**)	(12.48 ± 5.95)	(25.47 ± 8.63)	*
6-*O*-galloylbergenin (**3**)	1.94 ± 0.33	(46.21 ± 4.84)	**
6-*O*-galloynorlbergenin (**5**)	4.08 ± 0.49	(8.43 ± 7.87)	

[a] IC_{50} represents the 50% inhibitory concentration of the compound.

[b] If 50% inhibition was not reached at any test dose, the percentage of inhibition obtained at a test dose of 30 μM is given in parentheses (Inh%).

Results are presented as mean ± S.E.M. (n = 3–4). *p <0.05, **p <0.001 compared with the control value.

6-*O*-galloylnorbergenin.[21]

With the exception of **2** and **4**, which were insufficient in quantity for additional analysis, other three isocoumarins **1**, **3**, **5** were tested for anti-inflammatory activity based on effects against superoxide anion generation and elastase release by human neutrophils in response to fMLP/CB. The results were shown in Table 1, 6-*O*-galloylbergenin (**3**) exhibited the most potent effect in the superoxide anion assay with an IC_{50} value of 1.94 ± 0.33 μM. Obviously, both **3** and **5**, bearing an galloyl moiety at C-6' position, were more active than **1**. All three compounds showed no significant effect against elastase release.

Acknowledgments

This work was supported by grants from the National Science Council (NSC 97-2320-B-077-005-MY3) and the Chang Gung Memorial Hospital (CMRPF3A0011) in Taiwan. The authors are grateful to Mr. Jun-Chih Ou for identification of the studied plant.

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翼莖粉藤之ISOCOUMARIN類抗發炎活性成分研究

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（100 年 09 月 09 日受理，101 年 04 月 09 日接受刊載）

翼莖粉藤（*Cissus pteroclada* Hayata）屬於葡萄科（Vitaceae）粉藤屬植物，又名四方藤、翼莖山葡萄。其粗莖具舒筋活絡、去瘀生新之效，用於治風濕疼痛、四肢攣急、跌打內傷等。粉藤屬植物的化學成分被報導含coumarin、flavonoid、steronoid、triterpenoid及stilbene等多類化合物。本植物的根莖部藥材經乙醇抽取濃縮後，經由管柱層析分離、純化得到十四個化合物，包括五個isocoumarin類化合物—bergenin (**1**)、norbergenin (**2**)、6-*O*-galloylbergenin (**3**)、6-*O*-(4-hydroxy benzoyl) bergenin (**4**)與6-*O*-galloylnorbergenin (**5**)。除了化合物**1**、**3**、**4**與gallic acid外，其他十個化合物均首次分離自本植物。所得各成分的構造係經質譜及核磁共振等光譜資料的分析，並與文獻資料比對鑑定之。對化合物**1**、**3**、**5**進行抗發炎活性試驗，結果化合物**3**、**5**對嗜中性白血球所引起的超氧自由基生成有良好的抑制效果，其IC_{50}分別為1.94 ± 0.33與4.08 ± 0.49 μM。

關鍵字：翼莖粉藤、葡萄科、isocoumarin、抗發炎、超氧自由基

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