Four New Dibenzocyclooctene Lignans from *Kadsura renchangiana*

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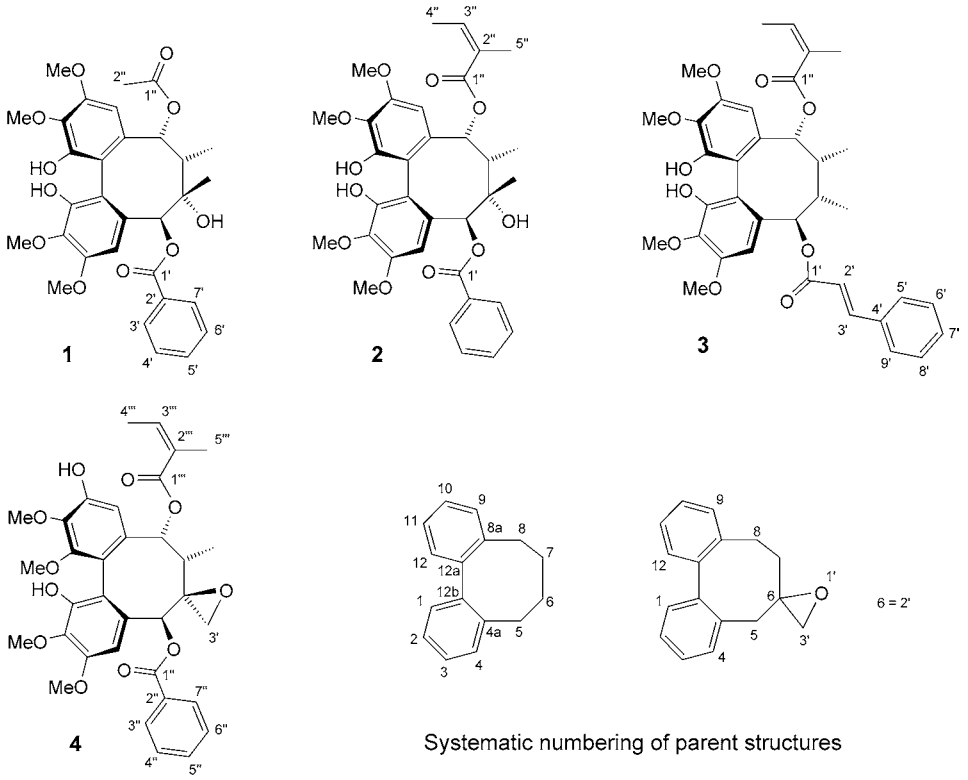
Four new dibenzocyclooctene-type lignans, named renchangianins A–D (**1**–**4**), were isolated from the stems of *Kadsura renchangiana*. Their structures and configurations were elucidated by spectroscopic methods, including 2D-NMR techniques. Renchangianin D (**4**) possesses a spiro[dibenzocyclooctene-6,2′-oxirane] parent structure previously unknown in plants of the Schisandraceae family.

Introduction. – The stems or roots of *Kadsura* plants are commonly used in China as the folk medicines for treatment of rheumatic arthritis, traumatic injury, gastric and duodenal ulcer, dysmenorrhea, abdominal pain, and related diseases [1]. Lignans, especially of the dibenzocyclooctene type, are the principal bioactive constituents of *Kadsura* medicinal plants. Pharmacological studies have revealed various beneficial activities, including antitumor, antiviral, antihepatotoxic, and antioxidant effects either of the crude extracts or of isolated constituents from *Kadsura* plants [2][3]. In previous studies, we had isolated several new dibenzocyclooctene lignans from *Kadsura interior* and *K. heteroclita* [4][5], and their various biological activities such as antitumor-promoting effects, calcium antagonism, anti-lipid peroxidation, and anti-HIV effects were reported [6–10]. In our continuing efforts to search for new bioactive natural products from *Kadsura* medicinal plants, chemical investigation of the stems of *Kadsura renchangiana*, indigenous mainly to South China, now led to the isolation and identification of four new dibenzo[*a*,*c*]cyclooctene lignans named renchangianins A–D (**1**–**4**). This paper deals with the isolation and characterization of the new compounds.

Results and Discussion. – Repeated column chromatography (CC) of the Et_2O extract of the stems of *Kadsura renchangiana* yielded renchangianins A–D (**1**–**4**). Renchangianin A (**1**), obtained as colorless needles, had the molecular formula $C_{31}H_{34}O_{11}$, as determined by HR-ESI-MS (*m*/*z* 605.1983 ($[M+Na]^+$). The UV spectrum of **1**, with a maximum absorption at 222 nm and two shoulders at 274 and 284 nm, respectively, along with the corresponding ^{1}H- and ^{13}C-NMR spectra (*Tables 1* and *2*, resp.) indicated that **1** was a dibenzocyclooctene-type lignan [11].

The ^{1}H-NMR spectrum of **1** (*Table 1*) showed a *singlet* at δ_H 1.38 (Me–C(6)) and a *doublet* at δ_H 1.27 ($J = 7.1$ Hz, Me–C(7)), the latter indicating the presence of a Me group attached to a tertiary, OH-bearing (δ_H 2.13 (br. *s*)) C-atom. In the HMBC spectrum of **1** (*Fig. 1*), the resonance at δ_H 5.96 (*s*, H–C(5)) correlated with the C-atoms at δ_C 42.9 (C(7)), 74.2 (C(6)), and 28.8 (*Me*–C(6)), and the resonance at δ_H 5.74



(*s*, H–C(8)) correlated with δ_C 42.9 (C(7)), 74.2 (C(6)), and 17.1 (*Me*–C(7)). These two benzylic ^{1}H-NMR resonances indicated two acyloxy groups at C(5) and C(8), respectively, similar to interiotherin C [6] and acetylschisantherin L [12]. The *singlet* at δ_H 5.74 (H–C(8)) suggested that H–C(7) and H–C(8) were *cis*-oriented, the acyloxy group at C(8) being α-oriented [13].

The ^{1}H-NMR spectrum of **1** showed signals for two aromatic H-atoms at δ_H 6.72 (*s*, 1 H) and 6.79 (*s*, 1 H), and four MeO groups at δ_H 3.93, 3.96, 3.25, and 3.24 (4*s*, 3 H each) on two aromatic rings. Cross peaks for H–C(5) with δ_C 107.7 and for H–C(8) with δ_C 109.9 in the HMBC spectrum suggested that these two aromatic resonances were due to C(4) and C(9), respectively. Their corresponding ^{1}H-NMR signals were assigned to the resonances at δ_H 6.72 (H–C(4)) and 6.79 (H–C(9)), respectively, by a HMQC experiment. The HMBC correlations of H–C(4) with the aromatic signals at δ_C 150.6 and 135.2, and of H–C(9) with δ_C 149.5 and 138.7, indicated that these four C-atoms were C(3), C(2), C(10) and C(11), respectively. The HMBC correlations of the four MeO groups (δ_H 3.93, 3.96, 3.25, 3.24) with the C-atoms at δ_H 135.2 (C(2)), 150.6 (C(3)), 149.5 (C(10)), and 138.7 (C(11)), respectively, unequivocally revealed the aromatic substitution pattern.

The absence of the typical ^{13}C-NMR methylenedioxy signal at δ_C 100–102 [14] (*Table 2*) and two H-atom signals at δ_H 5.78 and 5.85 (2 br. *s*, 1 H each), lacking any

Table 1. *400 MHz ^{1}H-NMR Data of* **1**–**4**. In $CDCl_3$ at 27°; δ in ppm, J in Hz. Abbreviations: Ac, acetyl; Ang, angeloyl; Bz, benzoyl; Cin, cinnamoyl.

	1	**2**	**3**	**4**
H–C(4)	6.72 (*s*)	6.71 (*s*)	6.55 (*s*)	6.48 (*s*)
H_α–C(5)	5.96 (*s*)	5.97 (*s*)	5.97 (*d*, J = 7.6)	5.54 (*s*)
H–C(6)	–	–	2.22 (*m*)	–
H–C(7)	2.38 (*q*, J = 7.2)	2.43 (*q*, J = 7.2)	2.38 (*m*)	3.07 (*q*, J = 7.2)
H_β–C(8)	5.74 (*s*)	5.76 (*s*)	5.76 (*s*)	5.77 (*s*)
H–C(9)	6.79 (*s*)	6.83 (*s*)	6.79 (*s*)	6.91 (*s*)
Me–C(6)	1.38 (*s*)	1.36 (*s*)	0.99 (*d*, J = 7.1)	-
Me–C(7)	1.27 (*d*, J = 7.1)	1.38 (*d*, J = 7.2)	1.26 (*d*, J = 7.1)	1.04 (*d*, J = 7.2)
2-MeO	3.93 (*s*)	3.87 (*s*)	3.87 (*s*)	3.87 (*s*)
3-MeO	3.96 (*s*)	3.95 (*s*)	3.90 (*s*)	3.91 (*s*)
10-MeO	3.25 (*s*)	3.21 (*s*)	3.77 (*s*)	–
11-MeO	3.24 (*s*)	3.32 (*s*)	3.53 (*s*)	3.34 (*s*)
12-MeO	–	–	–	3.19 (*s*)
6-OH	2.13 (br. *s*)	2.35 (br. *s*)	–	–
1-OH	5.78 (br. *s*)	6.49 (br. *s*)	5.54 (br. *s*)	5.76 (br. *s*)
10-OH	–	–	–	5.52 (br. *s*)
12-OH	5.85 (br. *s*)	7.27 (br. *s*)	5.90 (br. *s*)	–
Ac	1.60 (*s*, 3 H)	–	–	–
CH_2(3′)	–	–	–	2.94/2.92 (*AB*, $J \approx 3.6$, 2 H)
Bz[a]):				
H–C(3′,7′)	7.42 (*d*, J = 7.6)	7.42 (*d*, J = 7.2)	–	7.45 (*d*, J = 7.5)
H–C (4′,6′)	7.28 (*t*, J = 7.5)	7.26 (*t*, J = 7.7)	–	7.29 (*t*, J = 7.7)
H–C (5′)	7.49 (*t*, J = 7.3)	7.49 (*d*, J = 7.2)	–	7.46 (*m*)
Cin:				
H–C(2′)	–	–	6.03 (*d*, J = 16.0)	–
H–C(3′)	–	–	7.15 (*d*, J = 16.0)	–
H–C(5′,9′)	–	–	7.40 (*m*)	–
H–C(6′,7′,8′)	–	–	7.34 (*m*)	–
Ang[b]):				
H–C(3″)	–	5.97 (*m*)	5.87 (*dq*, J = 7.2, 1.2)	5.94 (*dq*, J = 7.2, 1.2)
Me(4″)	–	1.90 (*d*, J = 7.2)	1.87 (*d*, J = 7.2)	1.87 (*dd*, J = 7.2, 1.3)
Me(5″)	–	1.32 (*s*)	1.34 (*s*)	1.30 (*s*)

[a]) Doubly primed atom numbering for the Bz group in **4** (see chemical formulae). [b]) Triply primed atom numbering for the Ang group in **4**.

HMQC correlation, suggested the presence of two additional OH groups on the aromatic rings, as confirmed by IR (bands at 3563 and 3427 cm^{-1}). Considering the positions of the MeO groups, the two aromatic OH groups were located at C(1) and C(12), as corroboarated by NOESY correlations between the 2-MeO and the 1-OH group (δ_H 5.78 (br. *s*, 1 H)), and between the 11-MeO and the 12-OH group (δ_H 5.85 (br. *s*, 1 H) (*Fig. 1*).

In the EI mass spectrum, the peaks at *m*/*z* 522 ($[M - AcO]^+$), 400 [$M - C_6H_5COOH - AcO]^+$), and 105 ($[C_6H_5CO]^+$) suggested the presence of an acetyl (Ac) and a benzoyl (Bz) group, as confirmed by ^{1}H-NMR resonances at δ_H 1.60 (*s*, Ac) and δ_H 7.42 (*d*, 2 H of Bz), 7.28 (*t*, 2 H of Bz), and 7.49 (*t*, 1 H of Bz), along with the corresponding Ac ^{13}C-NMR signals (δ_C 168.8 and 20.1) and the C=O resonance of the Bz group (δ_C 164.8). The HMBC correlations of δ_H 5.74 (H–C(8)) with δ_C 168.8

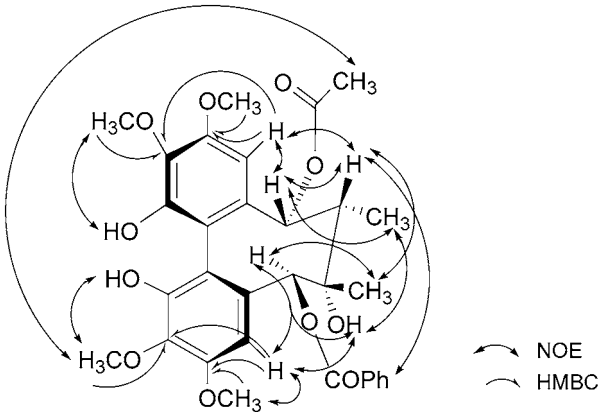


Fig. 1. *Key HMBC and NOESY correlations observed for compound* **1**

Table 2. *100 MHz ^{13}C-NMR Data of* **1**–**4**. In $CDCl_3$ at 27°; δ in ppm. Abbreviations: Ac, acetyl; Ang, angeloyl; Bz, benzoyl; Cin, cinnamoyl.

	1	**2**	**3**	**4**		**1**	**2**	**3**	**4**
C(1)	146.9	147.1	147.5	147.6	Bz[a]):				
C(2)	135.2	135.4	135.2	135.5	C(1′)	164.8	164.8	–	164.6
C(3)	150.6	150.7	150.6	151.3	C(2′)	129.0	129.5	–	129.6
C(4)	107.7	107.8	107.2	105.4	C(3′,7′)	129.5	128.1	–	129.2
C(4a)	129.8	129.7	131.1	130.7	C(4′,6′)	128.1	129.1	–	128.1
C(5)	85.0	85.2	80.8	84.3	C(5′)	133.3	133.2	–	133.2
C(6)	74.2	74.2	38.8	60.4					
C(7)	42.9	43.1	38.8	37.5	Cin:				
C(8)	83.6	83.7	80.8	80.0	C(1′)	–	–	165.6	–
C(8a)	135.4	135.8	136.2	135.6	C(2′)	–	–	117.9	–
C(9)	109.9	109.6	110.2	109.7	C(3′)	–	–	144.6	–
C(10)	149.5	149.4	148.9	149.5	C(4′)	–	–	134.1	–
C(11)	138.7	138.6	138.8	138.9	C(5′,9′)	–	–	128.8	–
C(12)	149.4	147.1	148.9	150.1	C(6′,8′)	–	–	130.3	–
C(12a)	118.5	118.7	119.6	118.2	C(7′)	–	–	127.9	–
C(12b)	115.9	115.9	116.3	115.5					
6-Me	28.8	28.8	15.7	–	Ang[b]):				
7-Me	17.1	17.3	20.5	14.9	C(1″)	–	165.2	166.8	166.1
2-MeO	60.7	59.7	60.4	60.4	C(2″)	–	125.6	127.1	126.6
3-MeO	55.9	55.9	55.9	55.9	C(3″)	–	141.6	139.4	140.4
10-MeO	59.6	60.4	60.6	–	Me(4″)	–	15.8	15.7	15.6
11-MeO	59.8	59.5	60.1	59.7	Me(5″)	–	19.9	20.3	19.8
12-MeO	–	–	–	59.7					
C(3′)	–	–	–	47.3	Ac:				
					*Me*C=O	20.1			
					Me*C*=O	168.8	–	–	–

[a]) Doubly primed atom numbering for the Bz group in **4** (see chemical formulae). [b]) Triply primed atom numbering for the Ang group in **4**.

(Me*C*O), of δ_H 1.60 (Ac) with δ_C 168.8, of δ_H 5.96 (H–C(5)) with δ_C 164.8 (Ph*C*O), and of δ_H 7.42 (2 H of Bz) with δ_C 164.8 (Ph*C*O) revealed that the AcO and BzO groups were located at C(8) and C(5), respectively. These assignments were further confirmed by NOESY cross-peaks of H–C(8) (δ_H 5.74) with H–C(9) (δ_H 6.79), and of H–C(5) (δ_H 5.96) with H–C(4) (δ_H 6.72) (see *Fig. 1*).

The circular dichroism (CD) spectrum of **1** showed negative and positive *Cotton* effects at 237 and 220 nm, respectively, indicating that **1** contains an axially chiral (a*S*)-1,1′-biphenyl unit ((*P*)-helicity) [6]. The substituent positions and stereochemical assignments were strengthened by NOESY correlations between H–C(4) and 3-MeO, H–C(4) and H_α–C(5), H_α–C(5) and both *Me*–C(6) and 6-OH, H–C(9) and H_β–C(8), H_β–C(8) and both *Me*–C(7) and H–C(7), H–C(4) and 6-OH, 6-OH and *Me*–C(7), as well as between *Me*–C(6) and H–C(7). Further, the NOESY correlations between H–C(4) and H_α–C(5), *Me*–C(7) and H–C(8), as well as between H–C(8) and H–C(9) indicated a twist-boat-chair (TBC) conformation for the dibenzocyclooctene ring (*Fig. 1*) [12].

Based on the above considerations – and after simulating the structure of **1** by means of computer modeling (*Fig. 2*), giving rise to a conformation that was in accord with the observed NOESY spectrum – the structure of renchangianin A (**1**) was determined as ((a*R*,5*S*,6*S*,7*S*,8*R*)-8-acetoxy-5,6,7,8,-tetrahydro-1,6,12-trihydroxy-2,3,10,11-tetramethoxy-6,7-dimethyldibenzo[*a*,*c*]cycloocten-5-yl) benzenecarboxylate.

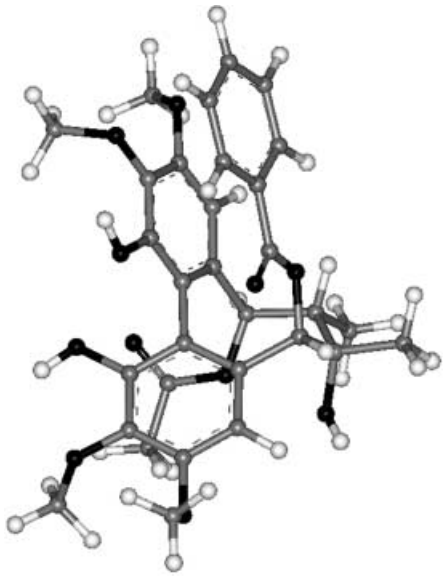


Fig. 2. *3D Structure of renchangianin A* (**1**) *generated by computer modeling* (see *Exper. Part*)

Renchangianin B (**2**) was obtained as a colorless powder. Its molecular formula was determined as $C_{34}H_{38}O_{11}$ by HR-ESI-MS (*m*/*z* 645.2304 ($[M+Na]^+$)). The UV and NMR spectra revealed that **2** had a C_{18}-lignan skeleton, with two OH groups and four MeO groups. Its IR, UV, CD, and NMR data were similar to those of **1**. Comparison of the NMR spectra of **2** with those of **1** (*Tables 1* and *2*) indicated that the Ac group in **1**

was replaced by an angeloyl (Ang; =2-methylbut-2-enoyl) group in **2** [δ_H 5.97 (*m*, 1 H), 1.90 (*d*, J = 7.2 Hz, 3 H), 1.32 (*s*, 3 H); δ_C 165.2, 125.6, 141.6, 15.8, 19.9]. The presence of an Ang group was confirmed by EI-MS, which showed signals at *m*/*z* 522 ($[M - C_4H_7COOH]^+$), 83 ($C_4H_7CO^+$), and 55 ($C_4H_7^+$). The Ang group was attached at C(8), as deduced from the HMBC correlations of δ_H 5.76 (H–C(8)) with the Ang C=O signal at δ_C 165.2, and of H–C(8) with δ_C 135.8 (C(8a)), 109.6 (C(9)), 118.7 (C(12a)), 74.2 (C(6)), 43.1 (C(7)), and 17.3 (Me–C(7)). Based on CD and NOESY data, the configuration of **2** was determined to be the same as that of **1**. Thus, the structure of renchangianin B was elucidated as ((a*R*,5*S*,6*S*,7*S*,8*R*)-5,6,7,8,-tetrahydro-1,6,12-trihydroxy-2,3,10,11-tetramethoxy-6,7-dimethyl-8-[((*Z*)-2-methylbut-2-enoyl)-oxy]dibenzo[*a*,*c*]cycloocten-5-yl) benzenecarboxylate.

Renchangianin C (**3**) was obtained as a yellow powder. Its molecular formula was determined as $C_{36}H_{40}O_{10}$ based on HR-ESI-MS (*m*/*z* 655.2515 ($[M + Na]^+$). Its IR, UV, CD, and NMR data were similar to those of **2**. The structural differences between **3** and **2** were the lack of the 7-OH group in **3** relative to **2**, and the replacement of the Bz group of **2** by a cinnamoyl (Cin) group in **3**.

In the dibenzocyclooctene ring of **3**, the two signals at δ_H 1.26 and 0.99 (2*d*, J = 7.1 Hz each) were assigned to the *cis*-oriented [15] Me–C(7) and Me–C(6) groups, respectively. A cinnamoyl (Cin) and an angeloyl (Ang) group were identified by EI-MS, with signals at *m*/*z* 484 ($[M - C_6H_5C_2H_2COOH]^+$), 147 ($C_6H_5C_2H_2COOH^+$), 131 ($C_6H_5C_2H_2CO^+$), 103 ($C_6H_5C_2H_2^+$); and at 532 ($[M - C_4H_7COOH]^+$), 83 ($C_4H_7CO^+$), and 55 ($C_4H_7^+$), respectively. This was corroboarated by ^{1}H-NMR, with Cin signals at δ_H 6.03, 7.15 (2*d*, J = 16.0 Hz, 1 H each), 7.34–7.40 (*m*, Ph), and with Ang signals at δ_H 5.87 (*dq*, J = 7.2, 1.2 Hz, 1 H), 1.87 (*d*, J = 7.2 Hz, 3 H), and 1.34 (*s*, 3 H). The HMBC spectrum of **3** clearly showed correlations of the resonance at δ_H 5.97 (H–C(5)) with the Cin C=O C-atom at δ_C 165.6, and of the H-atom at δ_H 5.76 (H–C(8)) with the Ang C=O resonance at δ_C 166.8, which revealed that the Cin and Ang groups were located at C(5) and C(8), respectively.

The CD spectrum of **3** indicated an axially chiral (a*S*)-1,1′-biphenyl unit (negative and positive *Cotton* effects at 250 and 218 nm, resp.). The stereochemical assignments were deduced by the following NOESY correlations (*Fig. 3*): H–C(4)/3-MeO, H–C(4)/H_α–C(5), Me–C(6)/H_α–C(5), Me–C(5)/H–C(4), H_α–C(5)/H–C(6), H–C(9)/H_β–C(8), H_β–C(8)/H–C(7), H_β–C(8)/Me–C(7), H–C(6)/Me–C(7), and H–C(7)/Me–C(6). The NOESY correlations between H–C(4)/H_α–C(5), Me–C(7)/H–C(8), and H–C(8)/H–C(9) indicated a TBC conformation of the fused cyclooctane ring. Thus, the structure of **3** was identified as ((a*R*,5*R*,6*S*,7*R*,8*R*)-5,6,7,8-tetrahydro-1,12-dihydroxy-2,3,10,11-tetramethoxy-6,7-dimethy l-5-[((*E*)-3-phenylprop-2-enoyl)oxy]dibenzo[*a*,*c*]cycloocten-8-yl) (*Z*)-2-methylbut-2-enoate.

Renchangianin D (**4**) was obtained as a brown powder. HR-ESI-MS gave rise to a quasi-molecular ion at 643.2153 ($[M + Na]^+$), indicating a molecular formula of $C_{34}H_{36}O_{11}$. The IR, CD, and NMR spectra revealed a dibenzocyclooctene-lignan skeleton, with oxygenated C(5)- and C(8)-atoms, as in **1**–**3**. However, in **4**, a different substitution pattern of the aromatic rings and an additional spirocyclic epoxy system were identified, the spiro center being at C(6)).

The ^{1}H-NMR spectrum of **4** showed two aromatic signals at δ_H 6.48 and 6.91(2*s*, 1 H each), four MeO groups at δ_C 3.91, 3.87, 3.34, and 3.19 (4*s*) on two aromatic rings. The

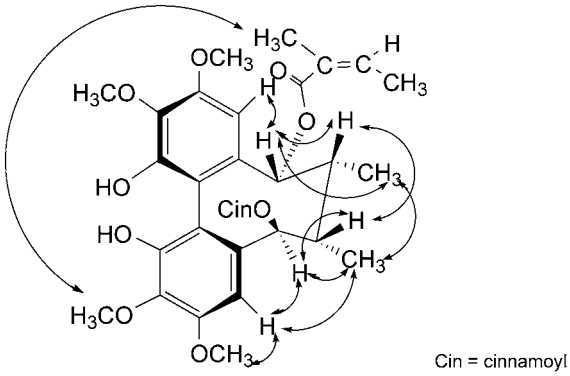


Fig. 3. *Key NOESY correlations observed for compound* **3**

absence of a typical OCH_2O ^{13}C-NMR signal at δ_C 100–102 (*Table 2*), and the presence of two ^{1}H-NMR signals at δ_H 5.76, 5.52 (2 br. *s*, 1 H each), lacking any HMQC correlation, suggested the presence of two OH groups on the aromatic rings, as confirmed by IR (3519, 3421 cm^{-1}). HMBC Cross-peaks of the above four MeO groups (δ_H 3.87, 3.91, 3.34, 3.19) with δ_C 135.5 (C(2)), 151.3 (C(3)), 138.9 (C(11)), and 150.1 (C(12)), respectively, revealed that one OH group was at C(10) (δ_C 149.5), as confirmed by an NOE correlation between the 11- and 12-MeO groups. In the ^{13}C-NMR spectrum of **4**, C(6) at δ_C 60.4 was identified as an oxygenated quaternary center by means of an HMQC experiment. By comparing the ^{1}H-NMR spectra of **4** and **2**, it was found that the Me–C(6) resonance at δ_H 1.36 (*s*, 3 H) in **2** was replaced by a methylene signal at δ_H 2.94, 2.92 (*AB*, $J \approx 3.6$ Hz) in **4** (*Table 1*), the corresponding ^{13}C-NMR signal (C(3′)) being found at δ_C 47.3, as assigned by the HMQC spectrum.

The extra degree of unsaturation of **4** relative to **2** suggested an additional ring system. Based on the information provided by ^{1}H- and ^{13}C-NMR, it was suggested that **4** contained a spirocyclic epoxy system, similar to both the valtrate-type iridoids in *Valerianan jatamansi* [16] and juncins I–M from *Junceella juncea* [17]. The ^{1}H-NMR data [δ_H 2.94, 2.92 (*AB*, $J \approx 3.6$ Hz, $CH_2(3')$] and ^{13}C-NMR data [δ_C 60.4 (C(6)), 47.3 (C(3′))] of **4** matched those of the corresponding epoxide system in 1-homoisoacevaltrate [δ_H 2.91, 3.02 (*AB*, $J \approx 5.0$ Hz; δ_C 64.2, 48.0]. The HMBC correlations of $CH_2(3')$ with C(6), and of H–C(7) at δ_H 3.07 (*d*, $J = 7.2$ Hz) with $CH_2(3')$ and C(6) confirmed that the $CH_2(3')$ epoxy methylene group was connected with C(6) (*Fig. 4*). This is the first time to find a lignan with a novel three-membered ether ring in the plants of the Schisandraceae family.

The CD spectrum of **4** again indicated an (a*S*)-1,1′-biphenyl unit, with negative and positive *Cotton* effects at 239 and 218 nm, respectively. The substituent positions and stereochemical assignments were strengthened by the following NOESY correlations: H–C(4)/3-MeO, H–C(4)/H_α–C(5), H_α–C(5)/$CH_2(3')$, H–C(9)/H_β–C(8), and H_β–C(8)/H–C(7). The correlations of $CH_2(3')$ with H–C(4), H_α–C(5) and Me–C(7) in the NOESY spectrum indicated that $CH_2(3')$ was α-oriented with respect to the fused cyclooctane ring. Cross-peaks between H–C(4)/H_α–C(5), Me–C(7)/H–C(8), and H–C(8)/H–C(9) in the NOESY spectrum further revealed a TBC

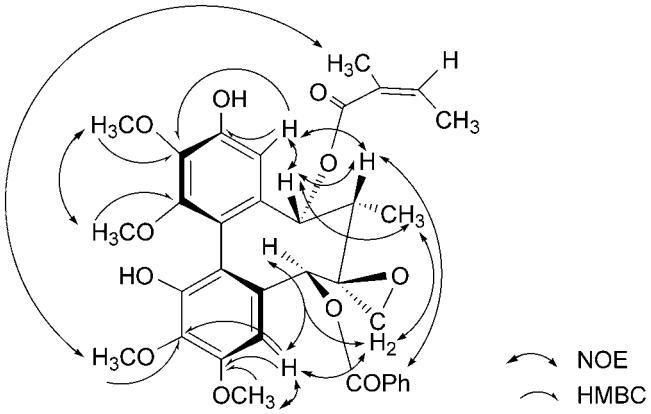


Fig. 4. *Key HMBC and NOESY correlations observed for compound* **4**

conformation of the cyclooctane ring. Thus, the structure of **4** was determined as (a*R*,5*S*,6*S*,7*S*,8*R*)-5-[(benzoyl)oxy]-2′,3′,5,6,7,8,-hexahydro-1,10-dihydroxy-2,3,11,12-tetramethoxy-7-methyl-8-[((*Z*)-2-methylbut-2-enoyl)oxy]spiro[dibenzo[*a*,*c*]cyclooctene-6,2′-oxirane].

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Experimental Part

General. Anal. TLC was performed on silica-gel plates (*Yan-tai Institute of Chemical Technology*), with petroleum ether/AcOEt 3:1 as eluent; visualization under UV light and by spraying with 10% aq. H_2SO_4, followed by heating. Column chromatogrphay (CC): silica gel (100–200, 200–300, or 300–400 mesh; *Qingdao Marine Chemical Factory*). Melting points (m.p.): *XT-4* micromelting point apparatus (*Tai-Ke Instrument Co.*, Beijng, China); uncorrected. Optical rotations (ORD): *JASCO P-1020* spectropolarimeter. UV Spectra: *Shimadzu UV-260* spectrophotometer, in anh. MeOH; λ_{max} in nm (log ε). CD Spectra: *JASCO J-715* spectropolarimeter. IR Spectra: *Avatar 360 E.S.P.* spectrophotometer (*Thermo Nicolet*), as KBr pellets; in cm^{-1}. ^1H- and ^{13}C-NMR Spectra: *Bruker AV-500* or *DRX-400* spectrometers, in $CDCl_3$, δ in ppm rel. to $SiMe_4$ (=0 ppm), *J* in Hz. EI-MS: *HP-5989A* mass spectrometer, in *m*/*z*. HR-ESI-MS: *APEX 7.0 TESLA FT-MS* apparatus. Computer modeling (see *Fig. 2*) was performed with the SYBYL (v. 6.9) software on a *Silicon Graphics* workstation. The structure was simulated annealing and optimized subsequently with the *Tripos* force-field energy-minimizing program.

Plant Material. The stems of *Kadsura renchangiana* were collected in Long-sheng County, Guang-xi autonomous region, P.R. China, in November 1997. A voucher specimen (DFC-XT9701) was deposited at the Herbarium of Materia Medica, Department of Pharmacognosy, School of Pharmacy, Fudan University, Shanghai, P.R. China.

Extraction and Isolation. The air-dried stems (10 kg) of *K. renchangiana* were ground and extracted exhaustively with 95% aq. EtOH at r.t. The EtOH extract was evaporated *in vacuo* to yield a semi-solid (650 g), which was suspended in H_2O (1000 ml) and extracted with Et_2O (7 × 350 ml). The resulting etheral soln. was concentrated to yield a residue (190 g), which was purified by CC (2.2 kg SiO_2; petroleum ether/AcOEt mixtures of increasing polarity), giving rise to several fractions (Fr.). *Fr.8*, eluted with petroleum ether/AcOEt 7:3, afforded **1** (150 mg). *Fr.9* (petroleum ether/AcOEt 6:4) was subjected to repeated CC (SiO_2; petroleum

ether/AcOEt 3:1) to yield **2** (13 mg) and **3** (68 mg). *Fr.7* (petroleum ether/AcOEt 8:2) was subjected to repeated CC (SiO_2; petroleum ether/AcOEt 3:1) to yield **4** (25 mg).

*((a*R,*5*S,*6*S,*7*S,*8*R*)-8-Acetoxy-5,6,7,8,-tetrahydro-1,6,12-trihydroxy-2,3,10,11-tetramethoxy-6,7-dimethyldibenzo[a,c]cycloocten-5-yl) Benzenecarboxylate* (*renchangianin A*; **1**). Colorless needles (MeOH). M.p. 231–232°. $[\alpha]_D^{28} = -177.9$ ($c = 0.89$, MeOH). UV (MeOH): 222 (4.11), 274 (sh, 3.14), 284 (sh, 3.15). CD ($c = 0.05$, MeOH): $\Delta\varepsilon_{204} = -11$, $\Delta\varepsilon_{220} = +23$, $\Delta\varepsilon_{237} = -60.5$. IR (KBr): 3563, 3427, 1746, 1720, 1587, 1494, 1456, 736, 713. ^{1}H- and ^{13}C-NMR: see *Tables 1* and *2*, resp. EI-MS: 582 (5, M^+), 522 (61), 451 (37), 400 (14), 357 (76), 105 (100), 77 (23). HR-ESI-MS: 605.1983 ($[M+Na]^+$, $C_{31}H_{34}NaO_{11}^+$; calc. 605.1999).

*((a*R,*5*S,*6*S,*7*S,*8*R*)-5,6,7,8,-Tetrahydro-1,6,12-trihydroxy-2,3,10,11-tetramethoxy-6,7-dimethyl-8-[((Z)-2-methylbut-2-enoyl)oxy]dibenzo[a,c]cycloocten-5-yl) Benzenecarboxylate* (*renchangianin B*; **2**). Colorless powder. $[\alpha]_D^{28} = -136.1$ ($c = 0.31$, MeOH). UV (MeOH): 226 (4.24), 273 (sh, 3.29), 283 (sh, 3.29). CD ($c = 0.05$, MeOH): $\Delta\varepsilon_{215} = +43$, $\Delta\varepsilon_{252} = -37$. IR (KBr): 3417, 1729, 1415, 1382, 1265, 738. ^{1}H- and ^{13}C-NMR: see *Tables 1* and *2*, resp. EI-MS: 622 (2, M^+), 522 (37), 450 (19), 400 (9), 357 (47), 105 (100), 83 (25), 77 (23), 55 (33). HR-ESI-MS: 645.2304 ($[M+Na]^+$, $C_{34}H_{38}NaO_{11}^+$; calc. 645.2312).

*((a*R,*5*R,*6*S,*7*R,*8*R*)-5,6,7,8-Tetrahydro-1,12-dihydroxy-2,3,10,11-tetramethoxy-6,7-dimethyl-5-[((E)-3-phenylprop-2-enoyl)oxy]dibenzo[a,c]cycloocten-8-yl) (Z)-2-methylbut-2-enoate* (*renchangianin C*; **3**). Yellow powder. $[\alpha]_D^{28} = +50.4$ ($c = 1.09$, MeOH). UV (MeOH): 222 (3.90), 254 (3.48), 275 (3.52). CD ($c = 0.05$, MeOH): $\Delta\varepsilon_{218} = +25$, $\Delta\varepsilon_{250} = -21$. IR (KBr): 3428, 1705, 1637, 1585, 1494, 1455, 736. ^{1}H- and ^{13}C-NMR: see *Tables 1* and *2*, resp. EI-MS: 632 (9, M^+), 532 (9), 501 (11), 484 (3), 402 (16), 384 (23), 370 (24), 353 (38), 147 (33), 131 (100), 103 (37), 83 (32), 77 (15). HR-ESI-MS: 655.2515 ($[M+Na]^+$, $C_{36}H_{40}NaO_{10}^+$; calc. 655.2519).

*(a*R,*5*S,*6*S,*7*S,*8*R*)-5-[(Benzoyl)oxy]-2′,3′,5,6,7,8,-hexahydro-1,10-dihydroxy-2,3,11,12-tetramethoxy-7-methyl-8-[((Z)-2-methylbut-2-enoyl)oxy]spiro[dibenzo[a,c]cyclooctene-6,2′-oxirane]* (*renchangianin D*; **4**). Brown powder. $[\alpha]_D^{28} = -14.7$ ($c = 0.65$, MeOH). UV (MeOH): 221 (3.99). CD ($c = 0.05$, MeOH): $\Delta\varepsilon_{203} = -14$, $\Delta\varepsilon_{218} = +13$, $\Delta\varepsilon_{239} = -20$. IR (KBr): 3519, 3421, 1717, 1595, 1494, 1457, 738, 705. ^{1}H- and ^{13}C-NMR: see *Tables 1* and *2*. EI-MS: 620 (34, M^+), 520 (2), 498 (1), 489 (51), 398 (2), 383 (14), 367 (15), 339 (15), 325 (11), 105 (100), 83 (35), 77 (31), 55 (54). HR-ESI-MS: 643.2153 ($[M+Na]^+$, $C_{34}H_{36}NaO_{11}^+$; calc. 643.2155).

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