Steroidal glycosides from *Convallaria majalis* whole plants and Their Cytotoxic Activity

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Supplementary Materials

Table 1. ^{13}C-NMR (125 MHz, C_5D_5N) spectral assignments for **1, 2,** and **3**

Position	**1**	**2**	Position	**1**	**2**	Position	**3**	Position		**3**
1	37.4	37.6	Gal 1'	102.7	102.7	1	37.4	Glc	1'	102.5
2	30.1	30.2	2'	73.2	73.2	2	30.0		2'	75.6
3	78.2	78.2	3'	75.6	75.5	3	78.2		3'	76.7
4	39.2	39.9	4'	79.9	79.9	4	39.3		4'	78.3
5	141.0	140.5	5'	75.3	75.3	5	140.9		5'	77.2
6	121.6	122.2	6'	60.5	60.5	6	121.7		6'	62.6
7	32.1	26.5				7	32.2			
8	31.6	35.6	Glc 1"	105.2	105.1	8	31.7	Rha	1"	102.7
9	50.2	43.6	2"	81.3	81.3	9	50.3		2"	72.7
10	37.0	37.4	3"	86.7	86.8	10	37.1		3"	72.9
11	21.0	20.4	4"	70.5	70.5	11	21.1		4"	74.0
12	39.8	31.9	5"	77.6	77.6	12	39.9		5"	70.4
13	40.4	45.1	6"	63.0	63.0	13	40.5		6"	18.6
14	56.5	86.4				14	56.7			
15	32.2	39.2	Glc' 1"'	104.9	104.9	15	32.2			
16	81.1	82.0	2"'	76.2	76.2	16	81.1			
17	62.7	59.7	3"'	77.7	77.7	17	62.9			
18	16.3	20.0	4"'	71.0	71.0	18	16.4			
19	19.4	19.3	5"'	78.7	78.7	19	19.4			
20	42.4	42.5	6"'	62.7	62.4	20	42.0			
21	14.9	15.2				21	15.0			
22	109.7	110.0	Xyl 1""	104.8	104.8	22	109.3			
23	26.3	26.6	2""	75.1	75.1	23	31.8			
24	26.1	26.2	3""	78.7	78.6	24	29.3			
25	27.5	27.6	4""	70.7	70.7	25	30.6			
26	65.0	65.1	5""	67.3	67.3	26	66.9			
27	16.3	16.3				27	17.3			

Table 2. ^{13}C-NMR (125 MHz, C_5D_5N) spectral assignments for **7**, **8**, and **9**.

Position	**7**	Position		Position	**8**	**9**	Position	**8**	**9**
1	37.7	Glc 1'	105.1	1	37.5	37.7	Gal 1'	102.7	102.6
2	32.6	2'	75.2	2	30.0	30.1	2'	73.1	73.1
3	71.3	3'	78.6	3	78.2	78.2	3'	75.5	75.5
4	43.4	4'	71.7	4	39.2	39.2	4'	79.8	79.8
5	142.0	5'	78.5	5	141.0	140.5	5'	75.2	75.2
6	121.1	6'	62.8	6	121.6	122.2	6'	60.5	60.5
7	32.3			7	32.3	26.7			
8	31.7			8	31.6	35.0	Glc 1"	105.1	105.1
9	50.4			9	50.3	43.6	2"	81.3	81.3
10	37.0			10	37.1	37.3	3"	86.7	86.8
11	21.2			11	21.1	20.4	4"	70.5	70.4
12	40.0			12	39.9	32.0	5"	77.6	77.6
13	40.8			13	40.8	45.4	6"	62.8	62.9
14	56.7			14	56.6	86.3			
15	32.5			15	32.4	40.0	Glc' 1"'	104.8	104.8
16	81.1			16	81.3	81.7	2"'	76.2	76.2
17	63.8			17	63.8	60.5	3"'	77.7	77.7
18	16.5			18	16.4	20.1	4"'	71.0	71.0
19	19.5			19	19.4	19.3	5"'	78.6	78.5
20	40.6			20	40.7	40.8	6"'	62.5	62.4
21	16.4			21	16.4	16.7			
22	110.7			22	110.7	113.0	Xyl 1""	104.9	104.9
23	37.1			23	37.0	37.1	2""	75.1	75.2
24	28.3			24	28.3	28.3	3""	78.7	78.7
25	34.4			25	34.4	34.4	4""	70.7	70.7
26	75.3			26	75.4	75.4	5""	67.3	67.3
27	17.4			27	17.4	17.4			
							Glc" 1""'	105.1	105.1
							2""'	75.2	75.2
							3""'	78.5	78.4
							4""'	71.7	71.7
							5""'	78.4	78.4
							6""'	62.8	62.8

Table 3. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **4**

Position	δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1 ax	0.98	m		36.3	Gal 1'		4.83	d	7.6	102.8
eq	1.69	br d	12.9		2'		4.40	dd	8.5, 7.6	73.1
2 ax	1.70	m		30.1	3'		4.10	m		75.5
eq	2.09	br dd	15.5, 5.5		4'		4.59	br s		79.8
3	3.86	m	$W_{1/2}$ = 27.4	78.1	5'		3.98	m		75.4
4 ax	2.44	t	12.2	38.9	6'	a	4.68	dd	15.1, 9.4	60.6
eq	2.71	br d	12.2			b	4.21	br d	15.1	
5	-			166.6						
6	5.75	s		126.9	Glc 1"		5.19	d	7.5	105.2
7	-			200.6	2"		4.44	dd	8.8, 7.5	81.3
8	2.74	d	13.1	49.5	3"		4.12	dd	8.8, 8.8	86.7
9	2.41	m		44.4	4"		3.83	dd	9.5, 8.8	70.5
10	-			38.5	5"		3.88	m	9.5, 5.6, 2.5	77.6
11 (2H)	1.54	m		20.5	6"	a	4.53	dd	11.4, 5.6	63.0
12 ax	1.41	m		31.4		b	4.02	dd	11.4, 2.5	
eq	2.21	m								
13	-			45.9	Glc' 1'''		5.59	d	7.5	105.0
14	-			84.6	2'''		4.09	dd	8.8, 7.5	76.2
15 a	3.48	m		41.9	3'''		4.11	dd	8.8, 8.8	77.8
b	2.21	m			4'''		4.22	dd	8.8, 8.8	71.7
16	5.06	dd	12.7, 9.0	82.2	5'''		3.96	m		78.7
17	2.72	t	8.3	58.3	6'''	a	4.60	br d	11.9	62.6
18	1.04	s		20.4		b	4.38	br d	11.9	
19	0.99	s		17.1						
20	2.02	t	6.7	42.5	Xyl 1''''		5.25	d	7.6	104.9
21	1.21	d	7.0	15.2	2''''		3.97	dd	8.0, 7.6	75.1
22	-			110.0	3''''		4.08	dd	8.6, 8.0	78.8
23 ax	1.93	ddd	13.7, 13.7, 4.7	26.6	4''''		4.11	m		70.7
eq	1.47	br dd	13.7, 3.6		5''''	a	4.24	dd	10.7, 4.9	67.4
24 ax	2.12	br dd	13.7, 12.3	26.2		b	3.68	dd	10.7, 10.4	
eq	1.34	br d	12.3							
25	1.55	m		27.5						
26 ax	4.02	dd	10.9, 2.5	65.0						
eq	3.31	br d	10.9							
27	1.07	d	7.0	16.3						

Table 4. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **5**

Position		δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1	ax	1.01	m		37.6	Gal 1'		4.86	d	7.5	102.7
	eq	1.72	br d	11.6		2'		4.41	dd	8.5, 7.5	73.2
2	ax	1.69	t	12.9	30.1	3'		4.08	m		75.5
	eq	2.06	m			4'		4.58	br s		79.8
3		3.88	m	$W_{1/2}$ = 23.3	78.2	5'		3.96	m		75.3
4	ax	2.44	dd	11.5, 10.5	39.2	6'	a	4.66	dd	13.5, 9.4	60.5
	eq	2.65	dd	11.5, 3.2			b	4.16	m		
5		-			140.5						
6		5.37	br s		122.2	Glc 1"		5.17	d	7.9	105.1
7	ax	2.48	m		26.6	2"		4.40	dd	8.5, 7.9	81.3
	eq	1.84	br d	6.6		3"		4.16	dd	8.8, 8.5	86.7
8		2.02	m		35.5	4"		3.80	dd	9.4, 8.8	70.4
9		1.78	m		43.5	5"		3.87	m		77.6
10		-			37.3	6"	a	4.50	br d	11.8	62.9
11	(2H)	1.51	m		20.3		b	4.03	br d	11.8	
12	ax	1.41	br d	12.1	31.8						
	eq	2.24	m			Glc' 1'''		5.57	d	7.5	104.8
13		-			44.9	2'''		4.06	dd	8.8, 7.5	76.2
14		-			86.3	3'''		4.08	dd	9.0, 8.8	77.7
15	a	2.28	br d	7.6	39.6	4'''		4.22	dd	9.0, 9.0	71.0
	b	1.78	m			5'''		3.96	m		78.6
16		5.21	m		82.3	6'''	a	4.57	br d	10.8	62.4
17		2.73	t	7.3	59.2		b	4.38	br d	10.8	
18		1.00	s		19.9						
19		0.96	s		19.2	Xyl 1''''		5.23	d	7.8	104.9
20		2.07	m		42.4	2''''		3.96	dd	8.2, 7.8	75.0
21		1.14	d	6.8	14.9	3''''		4.09	dd	9.0, 8.2	78.7
22		-			111.5	4''''		4.13	m		70.7
23	(2H)	2.15	m		34.3	5''''	a	4.23	br d	10.6	67.3
24		4.83	ddd	10.9, 5.5, 5.5	72.8		b	3.67	dd	10.6, 10.4	
25		2.24	m		31.7						
26	ax	3.89	br d	10.6	64.2	Glc" 1''''		5.04	d	7.7	101.2
	eq	3.47	br d	10.6		2''''		4.07	dd	8.8, 7.7	75.3
27		1.31	d	6.9	9.9	3''''		4.26	dd	9.0, 8.8	78.7
						4''''		4.30	dd	9.0, 9.0	71.6
						5''''		3.94	m		78.4
						6''''	a	4.51	br d	10.8	62.6
							b	4.39	br d	10.8	

Table5 . ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **6**

Position	δ_H	J (Hz)	δ_C	Position	δ_H	J (Hz)	δ_C
1 ax	1.01 m		37.6	Gal 1'	4.87 d	7.6	102.7
eq	1.71 br dd	12.9, 6.4		2'	4.42 dd	8.5, 7.6	73.1
2 ax	1.70 t	7.9	30.1	3'	4.08 dd	8.5, 8.5	75.5
eq	2.06 br dd	10.1, 6.8		4'	4.58 br s		79.8
3	3.88 m	$W_{1/2}$ = 22.5	78.0	5'	3.96 m		75.3
4 ax	2.44 t	10.8	39.2	6' a	4.65 m		60.5
eq	2.64 dd	13.9, 3.5		b	4.16 m		
5	-		140.4				
6	5.37 d	4.2	122.1	Glc 1"	5.17 d	7.9	105.1
7 ax	2.46 m		26.5	2"	4.41 dd	8.5, 7.9	81.3
eq	1.81 m			3"	4.16 dd	8.9, 8.5	86.8
8	1.97 m		35.4	4"	3.81 dd	9.1, 8.9	70.4
9	1.78 m		43.5	5"	3.88 m		77.6
10	-		37.3	6" a	4.54 br d	11.1	62.9
11 (2H)	1.52 m		20.3	b	4.04 br d	11.1	
12 ax	1.39 br d	9.7	31.8				
eq	2.22 m			Glc' 1'''	5.57 d	7.5	104.8
13	-		44.9	2'''	3.97 dd	8.8, 7.5	76.2
14	-		86.3	3'''	4.08 dd	9.2, 8.8	77.7
15 a	2.28 dd	10.6, 7.5	39.6	4'''	4.21 dd	9.2, 9.2	71.0
b	1.82 m			5'''	4.00 m		78.6
16	5.05 m		82.3	6''' a	4.57 br d	10.8	62.4
17	2.73 t	7.6	59.4	b	4.37 bb	10.8, 5.4	
18	0.99 s		20.0				
19	0.95 s		19.3	Xyl 1''''	5.23 d	7.8	104.9
20	2.07 m		42.1	2''''	3.95 dd	8.3, 7.8	75.0
21	1.01 d	6.9	15.1	3''''	4.07 dd	8.5, 8.3	78.7
22	-		111.9	4''''	4.12 m		70.7
23 ax	2.00 dd	12.4, 12.4	40.9	5'''' a	4.22 dd	10.7, 4.6	67.3
eq	2.73 dd	12.4, 5.3		b	3.67 dd	10.7, 10.5	
24	4.06 m		81.5				
25	1.91 m		38.1	Glc" 1'''''	4.94 d	7.7	106.3
26 ax	3.58 dd	11.8, 11.8	65.0	2'''''	4.06 dd	8.6, 7.7	75.7
eq	3.60 dd	11.8, 4.0		3'''''	4.21 dd	8.8, 8.6	78.6
27	1.13 d	6.5	13.5	4'''''	4.28 dd	8.8, 8.8	71.7
				5'''''	3.90 m		78.2
				6''''' a	4.52 br d	13.7	62.8
				b	4.39 br d	13.7	

Table 6. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **10**

Position	δ_H	J (Hz)	δ_C	Position	δ_H	J (Hz)	δ_C
1 ax	0.96 m		37.1	Gal 1'	4.87 d	7.6	102.8
eq	1.66 m			2'	4.41 dd	8.5, 7.6	73.1
2 ax	1.69 m		30.1	3'	4.09 m		75.5
eq	2.10 m			4'	4.58 br s		79.8
3	3.92 m	$W_{1/2}$ = 25.6	78.0	5'	3.96 m		75.3
4 ax	2.41 dd	13.6, 11.4	38.7	6' a	4.67 dd	14.5, 9.4	60.5
eq	2.69 dd	13.6, 2.4		b	4.17 br d	14.5	
5	-		141.6				
6	5.60 br s		128.4	Glc 1"	5.17 d	7.9	105.1
7	4.00 m		72.6	2"	4.41 dd	8.5, 7.9	81.3
8	1.79 m		40.8	3"	4.16 dd	8.8, 8.5	86.7
9	1.06 m		48.6	4"	3.81 dd	9.2, 8.8	70.4
10	-		36.9	5"	3.87 m		77.6
11 (2H)	1.44 m		21.1	6" a	4.53 m		62.9
12 ax	1.74 br d	13.5	39.9	b	4.05 m		
eq	1.14 m						
13	-		41.2	Glc' 1'"	5.56 d	7.5	104.8
14	1.35 m		56.2	2'"	4.08 dd	8.8, 7.5	76.2
15 a	2.85 m		35.4	3'"	4.10 dd	9.0, 8.8	77.7
b	2.04 m			4'"	4.21 dd	9.0, 9.0	71.0
16	5.04 m		81.6	5'"	3.93 m		78.6
17	1.94 m		63.3	6'" a	4.58 br d	12.7	62.4
18	0.94 s		16.4	b	4.38 dd	12.7, 5.4	
19	0.85 s		18.8				
20	2.24 t	6.6	40.7	Xyl 1'""	5.22 d	7.8	104.9
21	1.34 d	6.9	16.4	2'""	3.97 dd	8.3, 7.8	75.0
22	-		110.6	3'""	4.09 dd	8.9, 8.3	78.7
23 a	2.08 m		37.2	4'""	4.11 m		70.7
b	1.96 m			5'"" a	4.22 m		67.3
24 a	2.09 m		28.3	b	3.66 dd	10.7, 10.3	
b	1.68 m						
25	1.92 m		34.4	Glc" 1""	4.80 d	7.7	105.1
26 a	3.96 dd	9.2, 5.6	75.4	2""	4.02 dd	8.8, 7.7	75.2
b	3.45 dd	9.2, 7.0		3""	4.24 dd	8.8, 8.8	78.6
27	1.01 d	6.7	17.3	4""	4.23 dd	8.8, 8.8	71.7
				5""	3.92 m		78.4
				6"" a	4.55 br d	12.7	62.8
7-OH	5.71 br d	7.9		b	4.38 dd	12.7, 5.4	

Table 7. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **10a**

Position	δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1 ax	0.95	ddd	14.4, 13.3, 3.3	37.2	Gal 1'		4.89	d	7.6	102.8
eq	1.66	br dd	14.4, 3.3		2'		4.43	dd	8.2, 7.6	73.1
2 ax	1.67	m		30.1	3'		4.08	dd	8.6, 8.2	75.5
eq	2.11	m			4'		4.58	br s		79.8
3	3.91	m	$W_{1/2}$ = 28.7	78.0	5'		3.97	m		75.3
4 ax	2.42	dd	13.5, 11.7	38.8	6'	a	4.67	dd	14.8, 9.6	60.5
eq	2.69	dd	13.5, 2.4			b	4.18	m		
5	-			141.6						
6	5.61	br s		128.5	Glc 1"		5.18	d	7.9	105.1
7	4.01	m		72.6	2"		4.43	dd	8.7, 7.9	81.3
8	1.78	ddd	15.3, 13.1, 8.7	40.7	3"		4.16	dd	9.0, 8.7	86.7
9	1.05	ddd	8.7, 6.8, 3.0	48.6	4"		3.82	dd	9.0, 9.0	70.4
10	-			37.0	5"		3.88	ddd	9.0, 5.7, 2.1	77.6
11 ax	1.37	m		21.2	6"	a	4.52	dd	11.0, 5.7	63.0
eq	1.45	m				b	4.06	dd	11.0, 2.1	
12 ax	1.68	ddd	12.0, 12.0, 4.3	39.9						
eq	1.11	br d	12.0		Glc' 1'''		5.58	d	7.5	104.9
13	-			40.9	2'''		4.06	dd	8.8, 7.5	76.2
14	1.32	m		56.3	3'''		4.11	dd	8.8, 8.8	77.7
15 a	2.84	ddd	13.2, 6.5, 6.5	35.1	4'''		4.22	dd	8.8, 8.8	71.0
b	2.00	ddd	13.2, 13.2, 6.5		5'''		3.94	m		78.6
16	4.62	m		81.7	6'''	a	4.59	br d	12.6	62.5
17	1.81	dd	8.3, 6.5	62.3		b	4.38	dd	12.6, 3.7	
18	0.88	s		16.4						
19	0.84	s		18.9	Xyl 1''''		5.23	d	7.8	104.8
20	1.92	m		42.5	2''''		3.97	dd	8.1, 7.8	75.1
21	1.17	d	7.0	14.9	3''''		4.09	dd	8.6, 8.1	78.7
22	-			109.7	4''''		4.13	m		70.7
23 ax	1.90	ddd	13.7, 13.7, 4.7	26.4	5''''	a	4.23	dd	11.4, 4.9	67.3
eq	1.43	br dd	13.7, 2.1			b	3.68	dd	11.4, 10.7	
24 ax	2.14	m		26.2						
eq	1.35	m								
25	1.57	m		27.5						
26 ax	4.05	dd	11.0, 3.0	65.0						
eq	3.35	br d	11.0							
27	1.07	d	7.1	16.3						
7-OH	5.73	br d	7.8							

Table 8. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **11**

Position		δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1	ax	1.02	m		37.7	Gal 1'		4.86	d	7.6	102.6
	eq	1.73	br d	12.8		2'		4.40	dd	8.5, 7.6	73.1
2	ax	1.72	t	12.8	30.1	3'		4.11	m		75.5
	eq	2.08	br d	10.4		4'		4.58	br s		79.8
3		3.85	m	$W_{1/2}$ = 23.8	78.1	5'		3.97	m		75.2
4	ax	2.44	t	12.5	39.2	6'	a	4.65	dd	12.1, 8.1	60.5
	eq	2.66	dd	13.5, 2.0			b	4.16	br d	12.1	
5		-			140.5						
6		5.38	br d	5.6	122.1	Glc 1"		5.17	d	7.9	105.1
7		2.45	m		26.7	2"		4.41	dd	8.8, 7.9	81.3
		1.86	m			3"		4.14	dd	8.8, 8.8	86.7
8		1.96	m		35.0	4"		3.80	dd	9.3, 8.8	70.4
9		1.79	m		43.5	5"		3.85	m		77.5
10		-			37.3	6"	a	4.51	br d	10.8	62.9
11	(2H)	1.54	m		20.5		b	4.04	dd	10.8, 5.3	
12	ax	1.47	m		31.7						
	eq	2.31	br d	13.5		Glc' 1'''		5.56	d	7.5	104.8
13		-			47.8	2'''		4.05	dd	8.8, 7.5	76.2
14		-			84.7	3'''		4.07	dd	9.0, 8.8	77.7
15	a	2.42	dd	13.0, 7.7	42.4	4'''		4.19	dd	9.0, 9.0	71.0
	b	1.92	dd	13.0, 5.4		5'''		4.07	m		78.5
16		5.27	m		85.1	6'''	a	4.54	br d	12.4	62.3
17		3.36	d	9.7	61.5		b	4.35	dd	12.4, 5.4	
18		0.93	s		17.7						
19		0.98	s		19.3	Xyl 1''''		5.22	d	7.8	104.9
20		-			103.9	2''''		3.95	dd	8.4, 7.8	75.2
21		1.67	s		11.9	3''''		4.08	dd	9.2, 8.4	78.7
22		-			152.2	4''''		4.10	m		70.7
23	(2H)	2.24	m		23.7	5''''	a	4.22	m		67.3
24	a	1.88	m		31.4		b	3.67	dd	10.6, 10.4	
	b	1.48	m								
25		1.96	m		33.7	Glc" 1''''		4.83	d	7.8	105.1
26	a	3.94	dd	9.3, 6.6	75.2	2''''		4.03	dd	8.4, 7.8	75.2
	b	3.50	dd	9.3, 7.3		3''''		4.25	dd	8.8, 8.4	78.5
27		1.04	d	6.6	17.1	4''''		4.23	dd	8.8, 8.4	71.7
						5''''		3.95	m		78.4
						6''''	a	4.56	br d	11.5	62.8
							b	4.38	br d	11.5	

Table 9. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **12**

positions		δ_H		J (Hz)	δ_C	positions			δ_H		J (Hz)	δ_C
1	ax	0.96	m		37.5	Gal	1'		4.88	d	7.5	102.7
	eq	1.67	br d	12.6			2'		4.39	dd	8.3, 7.5	73.1
2	ax	1.70	br d	11.7	30.1		3'		4.11	m		75.5
	eq	2.09	m				4'		4.59	br s		79.8
3		3.87		$W_{1/2}$ = 23.6	78.1		5'		3.97	m		75.3
4	ax	2.42	t	12.3	39.2		6'	a	4.66	dd	14.2, 9.1	60.5
	eq	2.65	dd	10.6, 2.4				b	4.16	br d	9.1	
5		-			141.0							
6		5.30	br d	3.9	121.6	Glc(Ⅰ)	1"		5.18	d	7.8	105.1
7	ax	1.46	m		31.6		2"		4.41	dd	8.8, 7.8	81.3
	eq	2.09	m				3"		4.16	dd	9.2, 8.8	86.7
8		1.48	m		31.3		4"		3.81	dd	9.2, 8.9	70.4
9		0.87	m		50.2		5"		3.87	m		77.5
10		-			37.0		6"	a	4.51	br d	9.7	62.9
11	(2H)	1.42	m		21.2			b	4.05	br d	9.7	
12	ax	1.13	m		39.6							
	eq	1.73	br d	12.5		Glc(Ⅱ)	1'''		5.56	d	7.3	104.8
13		-			43.4		2'''		4.07	dd	8.8, 7.3	76.2
14		0.83	m		54.9		3'''		4.09	dd	9.2, 8.8	77.7
15	a	1.47	br d	7.1	34.4		4'''		4.20	m		71.0
	b	2.09	br d	7.0			5'''		3.91	m		78.4
16		4.80	m		84.4		6'''	a	4.57	br d	9.0	62.4
17		2.44	d	9.9	64.5			b	4.37	br d	9.0	
18		0.70	s		14.1							
19		0.89	s		19.3	Xyl	1''''		5.22	d	7.7	104.9
20		-			103.5		2''''		3.98	dd	8.5, 7.7	75.0
21		1.62	s		11.8		3''''		4.08	m		78.7
22		-			152.4		4''''		4.09	m		70.7
23	a	2.23	m		23.6		5''''	a	4.22	m		67.3
	b	2.17	m					b	3.67	dd	10.7, 10.6	
24	a	1.87	m		32.3							
	b	1.50	m			Glc(Ⅲ)	1'''''		4.82	d	7.7	105.1
25		1.94	m		33.7		2'''''		4.01	br d	7.5	75.2
26	a	3.48	dd	9.1, 7.1	75.4		3'''''		4.23	dd	8.5, 8.0	78.5
	b	4.05	m				4'''''		4.22	dd	8.5, 8.0	71.7
27		1.03	d	6.6	17.1		5'''''		3.96	m		78.6
							6'''''		4.55	br d	8.9	62.8
									4.38	br d	8.9	

Table 10. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **13**

Position		δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1	ax	0.96	ddd	12.8, 11.0, 3.0	37.4	Gal 1'		4.89	d	7.6	102.7
	eq	1.66	br d	11.1		2'		4.42	dd	8.6, 7.6	73.1
2	ax	1.68	t	13.6	30.0	3'		4.11	m		75.5
	eq	2.11	m			4'		4.60	br d	2.3	79.8
3		3.89	m	$W_{1/2}$ = 22.8	78.1	5'		3.97	m		75.3
4	ax	2.42	dd	13.0, 11.8	39.2	6'	a	4.68	dd	15.8, 9.6	60.5
	eq	2.65	dd	13.0, 2.3			b	4.18	m		
5		-			141.0						
6		5.29	br s		121.5	Glc 1"		5.19	d	7.9	105.1
7	ax	1.49	m		31.9	2"		4.42	dd	8.6, 7.9	81.3
	eq	1.83	dd	13.5, 2.3		3"		4.16	dd	8.8, 8.6	86.7
8		1.50	m		31.0	4"		3.82	dd	9.2, 8.8	70.4
9		0.84	m		50.0	5"		3.88	m		77.6
10		-			36.9	6"	a	4.53	br d	11.6	62.9
11	(2H)	1.39	m		20.5		b	4.05	br d	11.6	
12	ax	1.17	br d	12.1	39.2						
	eq	1.89	m			Glc' 1'''		5.58	d	7.4	104.8
13		-			40.3	2'''		4.08	dd	8.8, 7.4	76.2
14		0.96	m		56.8	3'''		4.10	dd	9.0, 8.8	77.7
15	a	2.05	m		33.4	4'''		4.23	dd	9.0, 9.0	71.0
	b	1.48	m			5'''		3.93	m		78.6
16		5.20	m		84.2	6'''	a	4.59	br d	12.4	62.4
17		2.23	d	6.3	67.8		b	4.38	br d	12.4	
18		0.90	s		13.5						
19		0.90	s		19.3	Xyl 1''''		5.24	d	7.8	104.9
20		-			76.7	2''''		3.98	dd	8.5, 7.8	75.1
21		1.73	s		21.8	3''''		4.09	dd	9.2, 8.5	78.7
22		-			163.0	4''''		4.12	m		70.7
23		4.53	br d	13.8	91.3	5''''	a	4.23	dd	10.6, 4.7	67.3
24	a	2.52	m		29.6		b	3.68	dd	10.6, 10.4	
	b	2.15	m								
25		2.09	m		34.8	Glc" 1'''''		4.85	d	7.7	105.1
26	a	4.16	dd	9.1, 6.0	75.3	2'''''		4.04	dd	8.8, 7.7	75.3
	b	3.53	dd	9.1, 7.1		3'''''		4.25	dd	9.0, 8.8	78.7
27		1.08	d	6.3	17.4	4'''''		4.23	dd	9.0, 9.0	71.6
						5'''''		3.95	m		78.4
						6'''''	a	4.55	m		62.7
							b	4.41	br d	11.9	

Table 11. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **13a**

Position	δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1 ax	0.96	ddd	12.0, 12.0, 3.9	37.4	Gal 1'		4.89	d	7.7	102.8
eq	1.67	br d	12.0		2'		4.42	dd	8.8, 7.7	73.2
2 ax	1.71	m		30.1	3'		4.10	m		75.6
eq	2.09	m			4'		4.60	br d	2.6	79.9
3	3.89	m	$W_{1/2}$ = 23.6	78.2	5'		3.98	m		75.3
4 ax	2.43	br d	13.3	39.2	6'	a	4.68	m		60.5
eq	2.66	dd	13.3, 2.5			b	4.18	br d	13.2	
5	-			141.1						
6	5.32	br d	5.0	121.7	Glc 1"		5.19	d	7.9	105.2
7 ax	1.48	br dd	13.3, 13.3	32.3	2"		4.44	dd	8.6, 7.9	81.3
eq	1.87	br d	13.3		3"		4.18	dd	8.8, 8.6	86.7
8	1.59	m		30.8	4"		3.83	dd	9.2, 8.8	70.5
9	0.85	m		50.3	5"		3.88	m		77.6
10	-			37.1	6"	a	4.53	dd	11.0, 2.4	63.0
11 (2H)	1.42	m		20.9		b	4.06	dd	11.0, 4.6	
12 ax	1.21	m		41.4						
eq	1.99	br d	12.1		Glc' 1'"		5.58	d	7.4	104.9
13	-			41.6	2'"		4.09	dd	8.8, 7.4	76.2
14	0.88	m		56.3	3'"		4.11	dd	9.0, 8.8	77.7
15 a	2.04	m		34.2	4'"		4.21	dd	9.0, 9.0	71.0
b	1.48	m			5'"		3.93	m		78.7
16	5.06	m		82.8	6'"	a	4.59	br d	12.4	62.5
17	2.44	d	8.5	70.2		b	4.38	dd	12.4, 4.7	
18	1.19	s		15.8						
19	0.93	s		19.4	Xyl 1'""		5.24	d	7.8	105.0
20	-			82.6	2'""		3.98	dd	8.3, 7.8	75.1
21	1.73	s		20.5	3'""		4.10	dd	9.0, 8.3	78.7
22	-			110.1	4'""		4.12	m		70.7
23 ax	1.79	br dd	12.9, 5.8	30.2	5'""	a	4.23	dd	10.9, 5.1	67.4
eq	2.37	br d	12.9			b	3.69	dd	10.9, 9.8	
24 (2H)	1.70	m		29.5						
25	1.69	m		30.6						
26 ax	3.70	dd	11.5, 10.0	67.3						
eq	3.60	dd	11.5, 3.8							
27	0.75	d	5.5	17.3						

Table 12. ^{1}H- and ^{13}C-NMR (500 and 125 MHz, C_5D_5N) spectral assignments for **14**

Position	δ_H		J (Hz)	δ_C	Position		δ_H		J (Hz)	δ_C
1 ax	0.94	m		37.4	Gal	1'	4.89	d	7.6	102.7
eq	1.64	br d	13.4			2'	4.42	dd	8.2, 7.6	73.2
2 ax	1.68	t	15.3	30.1		3'	4.07	m		75.5
eq	2.08	m				4'	4.60	br s		79.8
3	3.89	m	$W_{1/2}$ = 20.3	78.0		5'	3.97	m		75.3
4 ax	2.42	dd	14.2, 13.4	39.2		6' a	4.68	dd	14.5, 9.4	60.5
eq	2.65	dd	13.4, 2.1			b	4.18	m		
5	-			141.2						
6	5.30	br d	4.3	121.4	Glc	1"	5.19	d	7.9	105.2
7 ax	1.84	m		31.9		2"	4.43	dd	8.8, 7.9	81.3
eq	1.48	m				3"	4.17	dd	8.8, 8.8	86.7
8	1.48	m	13.1	30.9		4"	3.83	dd	9.0, 8.8	70.5
9	0.86	m		50.3		5"	3.87	br dd	9.0, 1.7	77.6
10	-			36.9		6" a	4.53	br d	11.0	63.0
11 (2H)	1.42	m		20.6		b	4.05	dd	11.0, 1.7	
12 ax	1.08	br dd	16.5, 10.2	38.1						
eq	2.16	m			Glc'	1'''	5.58	d	7.4	104.9
13	-			42.3		2'''	4.09	dd	8.8, 7.4	76.2
14	0.79	m		54.0		3'''	4.11	dd	8.8, 8.8	77.7
15 a	2.38	m		35.5		4'''	4.22	dd	9.0, 8.8	71.0
b	1.27	ddd	13.0, 13.0, 4.3			5'''	3.94	m		78.6
16	5.66	m		74.7		6''' a	4.59	br d	13.1	62.5
17	2.48	d	7.6	66.6		b	4.39	br d	13.1	
18	1.20	s		13.8						
19	0.87	s		19.4	Xyl	1''''	5.24	d	7.8	104.9
20	-			205.5		2''''	3.98	dd	8.0, 7.8	75.1
21	2.13	s		30.5		3''''	4.08	dd	8.8, 8.0	78.7
22	-			173.2		4''''	4.10	m		70.7
23 a	1.84	m		32.2		5'''' a	4.23	dd	10.9, 4.4	67.3
b	1.47	m				b	3.68	dd	10.9, 10.4	
24 a	1.96	m		29.0						
b	1.59	m			Glc"	1'''''	4.80	d	7.8	105.2
25	1.88	m		33.5		2'''''	4.03	dd	9.0, 7.8	75.2
26 a	3.97	dd	9.5, 6.1	74.7		3'''''	4.23	dd	9.0, 9.0	78.6
b	3.45	dd	9.5, 6.4			4'''''	0.22	dd	9.0, 9.0	71.5
27	0.92	d	8.3	16.9		5'''''	3.92	m		78.5
						6''''' a	4.58	br d	13.1	62.8
						b	4.38	br d	13.1	

Table 13. ^{1}H- and ^{13}C-NMR (600 and 150 MHz, C_5D_5N) spectral assignments for **15**

Position	δ_H	J (Hz)	δ_C	Position	δ_H	J (Hz)	δ_C
1 ax	0.88 br dd	12.4, 12.4	36.8	Gal 1'	4.88 d	7.8	102.5
eq	1.56 m			2'	4.43 dd	8.4, 7.8	72.9
2 ax	1.65 m		30.1	3'	4.09 m		75.3
eq	2.05 br d	15.5, 5.5		4'	4.58 br d	3.6	79.6
3	3.87 m	$W_{1/2}$ = 18.9	77.8	5'	3.95 m		75.1
4 ax	2.39 dd	13.2, 10.8	39.0	6' a	4.66 dd	15.0, 9.6	60.3
eq	2.64 dd	13.2, 2.4		b	4.15 m		
5	-		141.2				
6	5.29 br d	5.4	121.1	Glc 1"	5.18 d	7.8	105.0
7 ax	1.82 m		31.5	2"	4.43 dd	8.4, 7.8	81.1
eq	1.51 m			3"	4.16 dd	9.0, 8.4	86.4
8	1.49 m		30.0	4"	3.81 dd	9.0, 9.0	70.2
9	0.87 m		50.4	5"	3.87 ddd	9.0, 5.4, 2.4	77.4
10	-		37.0	6" a	4.50 dd	9.6, 2.4	62.7
11 (2H)	1.44 m		21.0	b	4.03 dd	9.6, 5.4	
12 ax	1.32 m		34.9				
eq	2.58 ddd	12.0, 3.6, 3.0		Glc' 1'''	5.58 d	7.8	104.7
13	-		46.0	2'''	4.05 dd	8.8, 7.8	76.0
14	1.30 m		56.2	3'''	4.09 dd	9.0, 8.8	77.8
15 a	2.11 ddd	16.8, 6.0, 2.8	32.2	4'''	4.20 dd	9.6 ,9.0	70.7
b	1.84 br dd	16.8, 2.8		5'''	3.92 m	9.6, 4.2, 1.8	78.4
16	6.57 br s		144.5	6''' a	4.58 dd	11.4, 1.8	62.2
17	-		155.0	b	4.36 dd	11.4, 4.2	
18	0.90 s		15.7				
19	0.86 s		19.0	Xyl 1''''	5.23 d	7.8	104.8
20	-		196.1	2''''	3.95 dd	8.4, 7.8	74.8
21	2.22 s		26.9	3''''	4.05 dd	8.8, 8.4	78.5
				4''''	4.09 m		70.5
				5'''' a	4.21 dd	11.4, 4.8	67.1
				b	3.66 dd	11.4, 10.8	

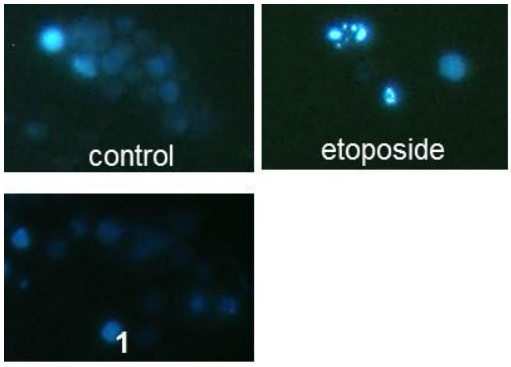

Fig. 1 Morphological observations of representative fields of HL-60 cells stained with DAPI to evaluate fragmented and condensed unclear chromatins after treatment with **1** (20 nM) or etoposide (15 nM) for 3h.

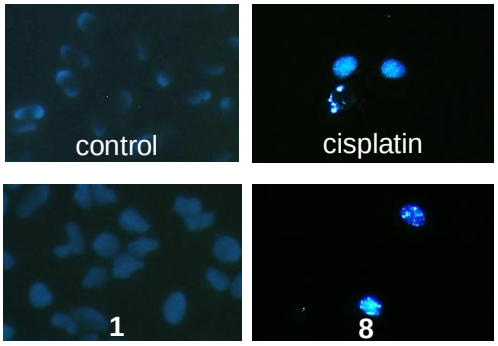

Fig. 2. Morphological observations of representative fields of A549 cells stained with DAPI to evaluate fragmented and condensed unclear chromatins after treatment with **1** (20 nM) for 3h, **8** (20 nM) or cisplatin (33 nM) for 24 h.

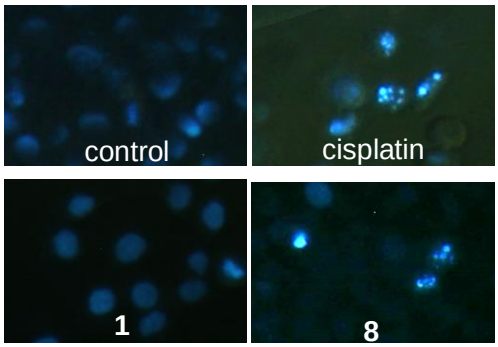

Fig.3. Morphological observations of representative fields of HSC-4 cells stained with DAPI to evaluate fragmented and condensed unclear chromatins after treatment with **1** (10 nM) for 3h, **8** (20 nM) or cisplatin (33 nM) for 48h.

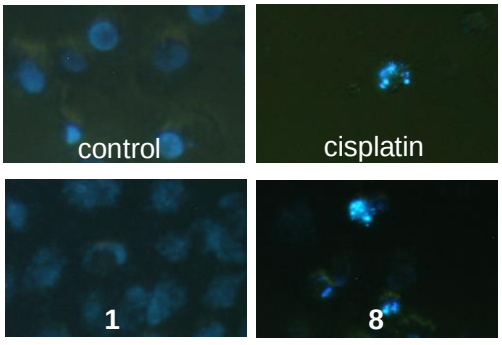

Fig. 4. Morphological observations of representative fields of HSC-2 cells stained with DAPI to evaluate fragmented and condensed unclear chromatins after treatment with **1** (10 nM) for 3h, **8** (20 nM) or cisplatin (33 nM) for 24h.