FIG. 1

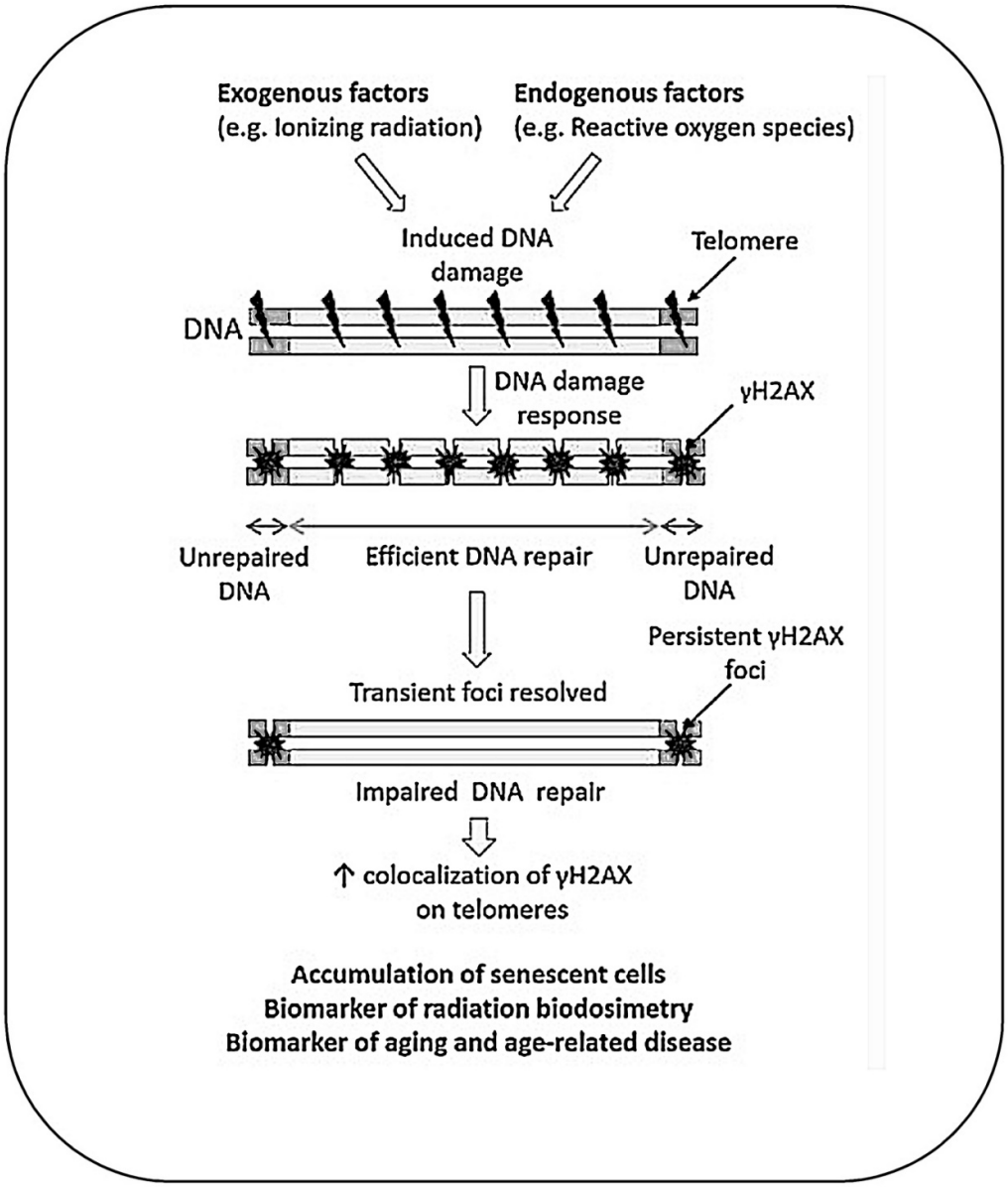
γH2AX: a sensitive molecular marker of DNA damage and repair
Exogenous factors
(e.g. Ionizing radiation)
Endogenous factors
(e.g. Reactive oxygen species)
Induced DNA damage
Telomere
DNA
DNA damage response
γH2AX
Unrepaired DNA
Efficient DNA repair
Unrepaired DNA
Persistent γH2AX foci
Transient foci resolved
Impaired DNA repair
↑ colocalization of γH2AX on telomeres
Accumulation of senescent cells
Biomarker of radiation biodosimetry
Biomarker of aging and age-related disease

FIG. 2

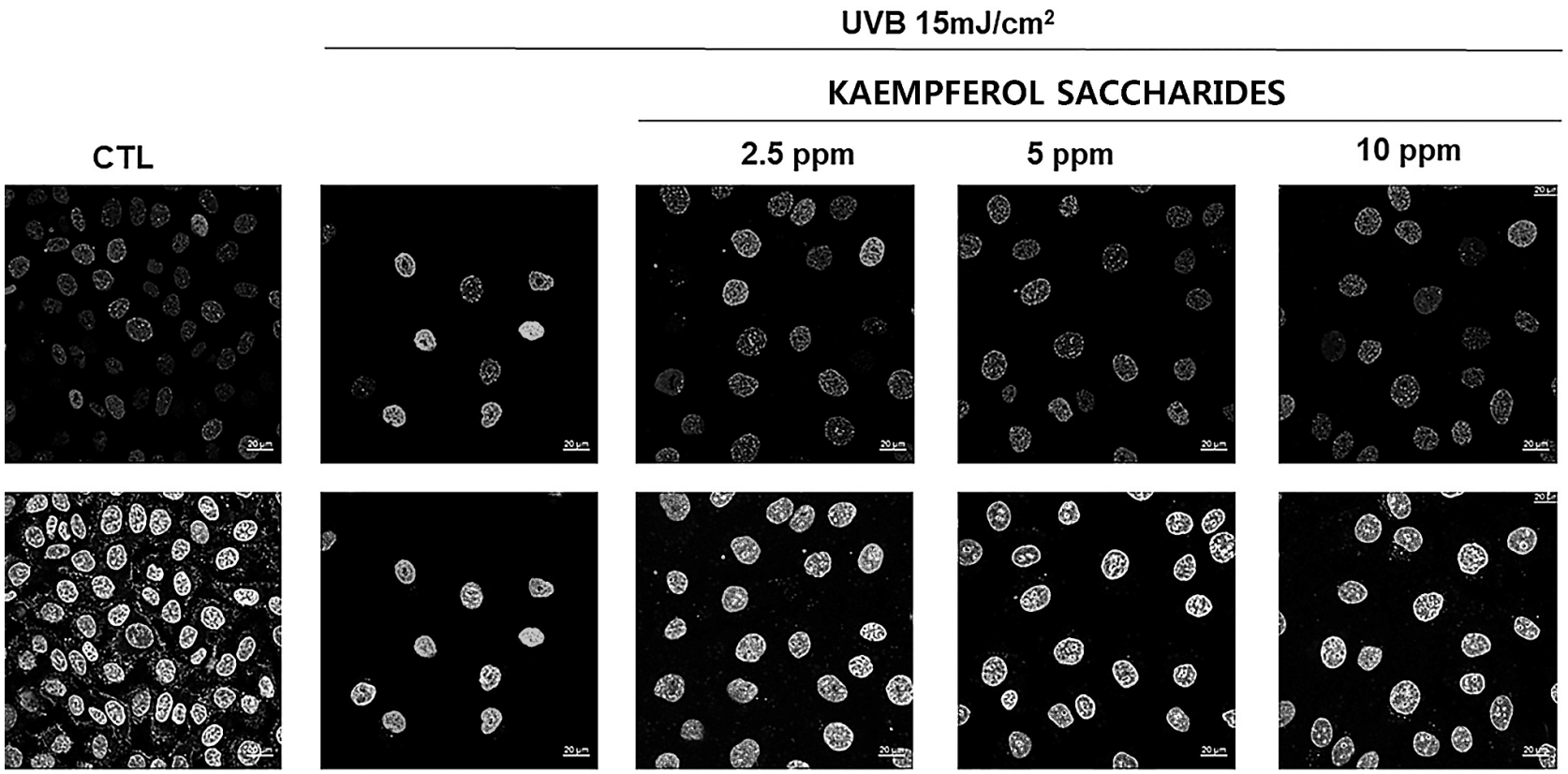
UVB 15mJ/cm2
KAEMPFEROL SACCHARIDES
CTL
2.5 ppm
5 ppm
10 ppm
Red : γ-H2AX , Blue :DAPI 400X

FIG. 3

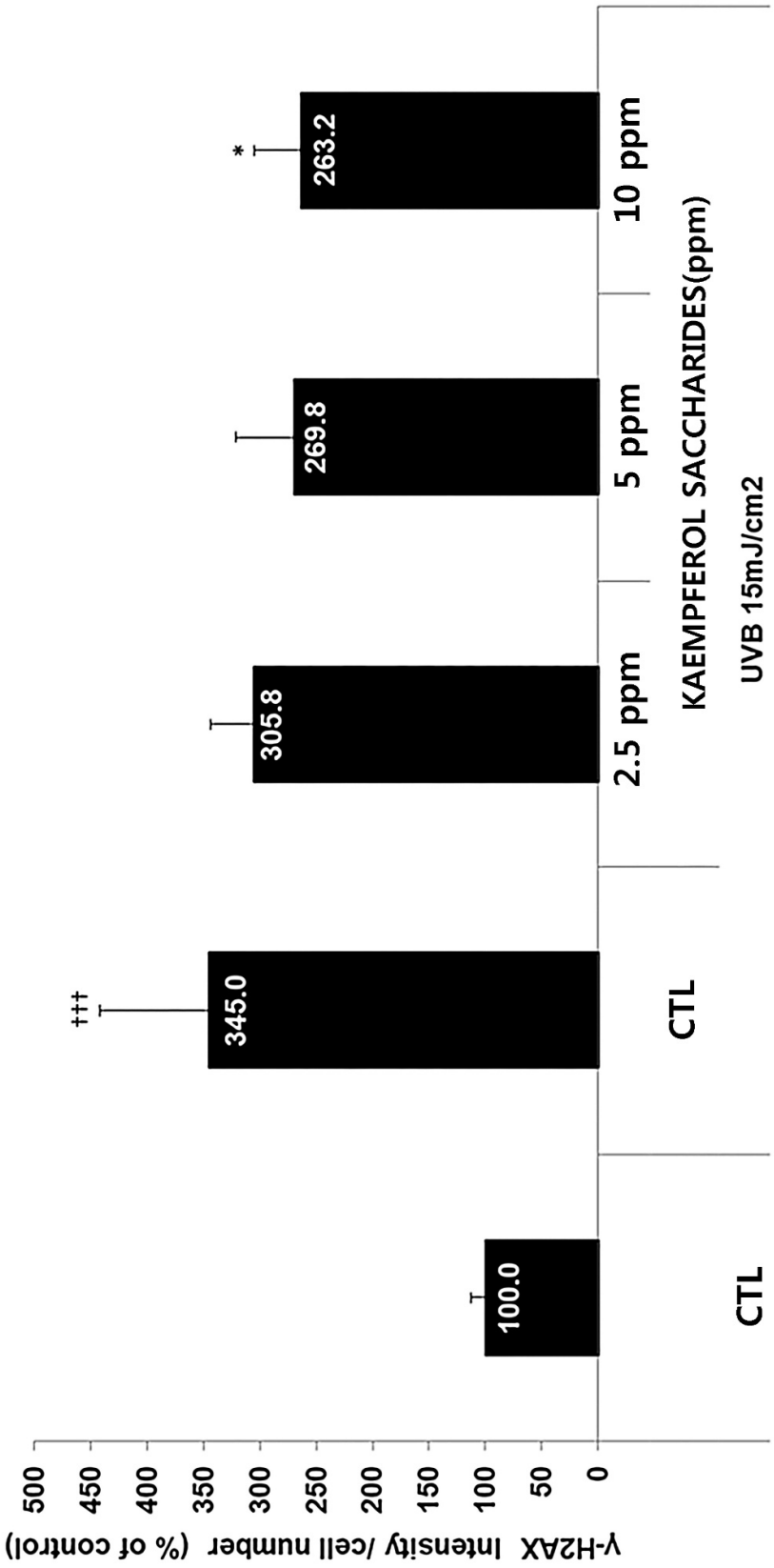
y-H2AX Intensity /cell number (% of control)
500
450
400
350
300
250
200
150
100
50
0
100.0
345.0
+++
305.8
269.8
263.2
*
CTL
CTL
2.5 ppm
5 ppm
10 ppm
KAEMPFEROL SACCHARIDES(ppm)
UVB 15mJ/cm2

FIG. 4

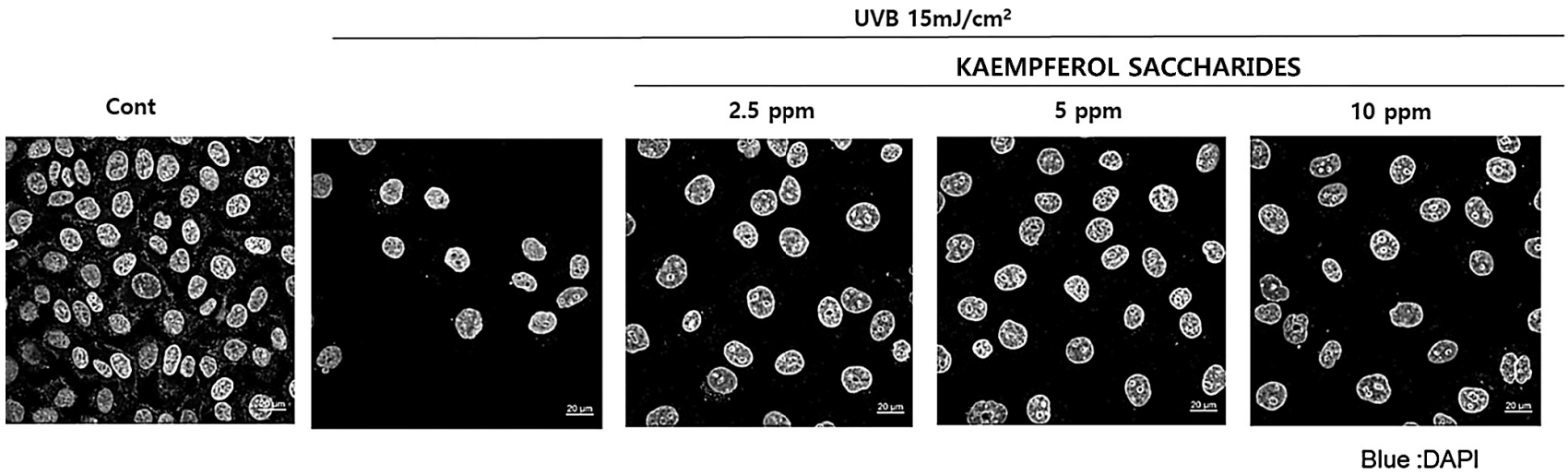
UVB 15mJ/cm²
KAEMPFEROL SACCHARIDES
Cont
2.5 ppm
5 ppm
10 ppm
20 μm
Blue :DAPI

FIG. 5

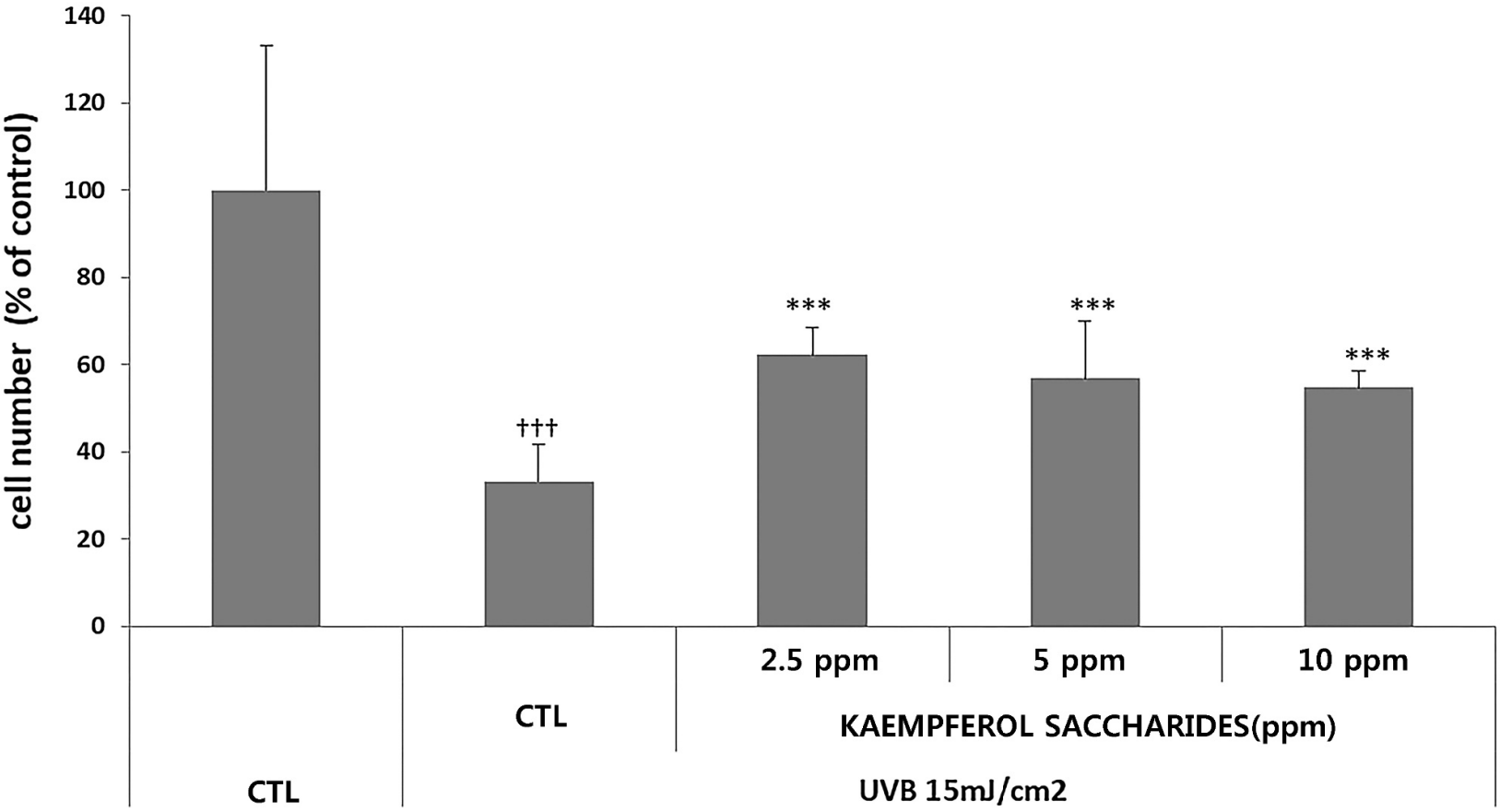
cell number (% of control)
140
120
100
80
60
40
20
0
†††
***
***
***
CTL
CTL
2.5 ppm
5 ppm
10 ppm
KAEMPFEROL SACCHARIDES(ppm)
UVB 15mJ/cm2

FIG. 6

^{1}H (multiplicity, *J* in Hz, 500 MHz) and ^{13}C (125 MHz) NMR data of compounds **1–4**.

	1		**2**		**3**		**4**	
no	^{13}C	^{1}H	^{13}C	^{1}H	^{13}C	^{1}H	^{13}C	^{1}H
2	158.67		158.89		158.63		158.81	
3	134.99		134.80		135.04		134.87	
4	179.77		179.51		179.75		179.49	
5	163.11		163.1		163.03		163.07	
6	99.95	6.20 (d, 2.0)	99.87	6.20 (d, 2.0)	99.94	6.23 (d, 1.7)	99.90	6.19 (d, 1.7)
7	165.89		165.69		165.85		165.76	
8	94.85	6.39 (d, 2.0)	94.87	6.39 (d, 2.0)	94.86	6.43 (d, 1.7)	94.92	6.39 (d, 1.7)
9	158.52		158.57		158.48		158.54	
10	105.67		105.78		105.67		105.77	
1'	122.64		122.89		122.65		122.92	
2',6'	132.54	8.11 (d, 8.9)	132.47	8.06 (d, 8.9)	132.53	8.14 (d, 8.9)	132.46	8.05 (d, 8.9)
3',5'	116.23	6.88 (d, 8.9)	116.16	6.89 (d, 8.9)	116.23	6.92 (d, 8.9)	116.18	6.92 (d, 8.9)
4'	161.58		161.4		161.57		161.37	
3-*O*-Gal (bridge)			**3-*O*-Glc (bridge)**		**3-*O*-Gal (bridge)**		**3-*O*-Glc (bridge)**	
1"	101.55	5.21 (d, 7.7)	100.83	5.35 (d, 7.6)	101.63	5.27 (d, 7.6)	100.97	5.37 (d, 7.6)
2"	79.97	3.98 (d, 9.7, 7.7)	81.93	3.68 (dd, 9.0, 7.6)	79.89	4.03 (dd, 9.4, 7.6)	81.94	3.66 (dd, 8.9, 7.7)
3"	75.39	3.63 (dd, 9.7, 4.3)	77.50	3.34*	75.08	3.67 (brd, 6.3)	77.52	3.40*
4"	70.35	3.75*	71.51	3.23*	70.26	3.81 (brd, 3.2)	71.26	3.28*
5"	75.10	3.78 (dd, 9.6, 3.4)	78.19	3.57 (d, 9.0)	75.08	3.72*	78.17	3.57 (d, 8.9)
6"	67.64	3.66*	68.34	3.78 (dd, 9.0, 3.7)	67.42	3.71*	68.22	3.78 (dd, 11.0, 1.2)
		3.48*		3.49*		3.47*		3.42*
6"-*O*-Rha			**6"-*O*-Rha**		**6"-*O*-Rha**		**6"-*O*-Rha**	
1"'	101.88	4.51 (d, 1.4)	102.08	4.48 (d, 1.4 Hz)	101.77	4.58 (d, 1.4)	101.99	4.58 (d, 1.4)
2"'	71.73	3.73 (dd, 3.1, 1.4)	71.69	3.75 (dd, 3.4, 1.8)	71.31	3.93 (dd, 3.1, 1.4)	71.26	3.91 (dd, 3.2, 1.6)
3"'	82.36	3.51*	82.45	3.50*	83.05	3.58*	83.14	3.53*
4"'	72.66	3.41 (d, 9.4)	72.62	3.39*	72.56	3.48 (d, 9.5)	72.48	3.41*
5"'	69.43	3.53*	69.38	3.44*	69.41	3.58*	69.37	3.44*
6"'	18.01	1.14 (d, 6.1)	17.88	1.06 (d, 6.0)	18.06	1.19 (d, 6.2)	17.91	1.05 (d, 5.8)
2"-*O*-Xyl (inner)			**2"-*O*-Xyl (inner)**		**2"-*O*-Glc (inner)**		**2"-*O*-Glc (inner)**	
1	105.48	4.74 (d, 7.0)	105.20	4.77 (d, 7.0)	105.41	4.78 (d, 6.9)	105.17	4.77 (d, 6.9)
2	74.86	3.40*	74.73	3.39*	74.78	3.41*	74.67	3.38*
3	77.09	3.39*	76.89	3.39*	77.01	3.41*	76.90	3.38*
4	71.06	3.53*	71.02	3.52*	70.82	3.39*	70.81	3.38*
5	66.69	3.97*	66.59	3.98 (dd, 11.6, 5.0)	77.52	3.21*	77.52	3.21*
		3.26 (dd, 11.7, 9.8)		3.26 (dd, 11.6, 9.3)	62.03	3.76 (dd, 12.1, 2.6)	62.02	3.73 (dd, 12.1, 2.8)
						3.72*		3.69*
3"'-*O*-Xyl (terminal)			**3"'-*O*-Xyl (terminal)**		**3"'-*O*-Xyl (terminal)**		**3"'-*O*-Xyl (terminal)**	
1	106.43	4.30 (d, 7.5)	106.37	4.31 (d, 7.5)	105.7	4.40 (d, 7.7)	105.63	4.37 (d, 7.7)
2	75.23	3.22 (dd, 9.1, 7.5)	75.29	3.23*	75.37	3.25*	75.44	3.25*
3	77.50	3.30*	77.06	3.36*	77.57	3.39*	76.82	3.38*
4	71.06	3.46*	71.08	3.48*	71.02	3.55 (dd, 9.1, 5.3)	70.99	3.52*
5	66.85	3.78 (dd, 11.4, 5.3)	66.85	3.77*	66.63	4.00 (dd, 11.3, 5.3)	66.53	3.97 (dd, 11.6, 4.9)
		3.11 (dd, 11.4, 10.5)		3.12 (dd, 11.5,		3.27*		3.24*

*Resonances were overlapped / Compounds were dissolved in CD_3OD

FIG. 7

^{1}H (multiplicity, *J* in Hz, 500 MHz) and ^{13}C (125 MHz) NMR data of compounds **5–8**.

	5		**6**		**7**		**8**	
no	^{13}C	^{1}H	^{13}C	^{1}H	^{13}C	^{1}H	^{13}C	^{1}H
2	159.37		159.47		158.51		158.67	
3	135.71		135.44		134.98		134.81	
4	179.58		179.39		179.72		179.41	
5	163.00		163.02		163.06		163.04	
6	100.04	6.20 (brs)	100.01	6.20 (d, 2.0)	99.92	6.17 (d, 2.0)	99.97	6.17 (d, 1.9)
7	166.19		166.1		165.96		166.15	
8	94.96	6.40 (brs)	94.99	6.40 (d, 2.0)	94.78	6.38 (d, 2.0)	94.88	6.37 (d, 1.7z)
9	158.58		158.62		158.43		158.49	
10	105.58		105.66		105.63		105.64	
1'	122.60		122.76		122.67		122.89	
2',6'	132.53	8.10 (d, 8.8)	132.45	8.06 (d, 8.9)	132.47	8.10 (d, 8.9)	132.37	8.05 (d, 8.9)
3',5'	116.12	6.87 (d, 8.8)	116.11	6.88 (d, 8.9)	116.23	6.88 (d, 8.9)	116.16	6.88 (d, 8.9)
4'	161.63		161.50		161.56		161.40	
3-*O*-Gal (bridge)			**3-*O*-Glc (bridge)**		**3-*O*-Gal (bridge)**		**3-*O*-Glc (bridge)**	
1"	105.52	5.02 (d, 7.8)	104.42	5.12 (d, 7.4)	101.47	5.28 (d, 7.7)	100.85	5.38 (d, 7.6)
2"	72.96	3.79 (dd, 9.6, 7.8)	75.75	3.44*	80.09	3.97*	81.91	3.65 (dd, 9.1, 7.5)
3"	75.23	3.53*	77.18	3.36*	75.17	3.61 (t, 6.4)	78.20	3.58*
4"	70.23	3.75*	71.68	3.20*	70.22	3.77 (d, 3.6)	71.39	3.26*
5"	75.50	3.65*	78.15	3.40*	75.10	3.68*	76.87	3.38*
6"	67.97	3.69 (dd, 10.2, 5.6)	68.96	3.81*	66.95	3.70 (dd, 9.6, 5.9)	68.08	3.80 (brd, 9.5)
		3.47*		3.38*		3.37*		3.35*
6"-*O*-Rha			**6"-*O*-Rha**		**6"-*O*-Rha**		**6"-*O*-Rha**	
1"'	101.91	4.51 (d, 1.3)	102.31	4.51 (d, 1.3)	101.81	4.51 (d, 1.8)	102.13	4.49 (d, 1.1 Hz)
2"'	71.70	3.76 (dd, 3.3, 1.3)	71.68	3.76 (dd, 3.3, 1.3)	72.06	3.57 (dd, 3.5, 1.8)	72.06	3.59*
3"'	82.39	3.53 (dd, 5.8, 3.3)	82.45	3.53 (dd, 5.8, 3.3)	72.28	3.49 (dd, 9.5, 3.4)	72.24	3.49 (dd, 9.5, 3.4)
4"'	72.68	3.43 (t, 8.5)	72.68	3.43 (t, 8.5)	73.86	3.26*	73.84	3.24*
5"'	69.44	3.54*	69.41	3.54*	69.71	3.51*	69.70	3.42 (dd, 9.5, 6.3)
6"'	18.02	1.15 (d, 6.2)	17.94	1.15 (d, 6.2)	17.96	1.17 (d, 6.3)	17.86	1.08 (d, 6.2)
3"'-*O*-Xyl (terminal)			**3"'-*O*-Xyl (terminal)**		**2"-*O*-Xyl (inner)**		**2"-*O*-Xyl (inner)**	
1	106.47	4.31 (d, 7.4)	106.39	4.32 (d, 7.5)	105.50	4.74 (d, 7.2)	105.16	4.77 (d, 6.9)
2	75.08	3.53*	75.29	3.22*	74.88	3.38*	74.70	3.38*
3	77.52	3.26*	77.52	3.31*	77.11	3.33*	77.03	3.33*
4	71.04	3.45*	69.41	3.46*	71.03	3.51*	70.99	3.51*
5	66.87	3.76*	66.86	3.76 (dd, 11.5, 4.7),	66.71	3.96*	66.57	3.97 (dd, 11.6, 4.9)
		3.09 (dd, 11.5, 10.3)		3.12 (dd, 11.5, 10.3)		3.24*		3.24 *

*Resonances were overlapped. / Compounds were dissolved in CD_3OD.