

SUPPLEMENTARY MATERIAL TO
**DNA protective activity of triterpenoids isolated from medicinal
mushroom *Fomitopsis betulina***

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TABLE S-I. ¹H- (500 MHz) and ¹³C-NMR (125 MHz) Spectral Data of **1-3**

C/H	1 (MeOD-d ₄)		2 (MeOD-d ₄)		3 (MeOD-d ₄)	
	δ _C / ppm	δ _H / ppm, (J / Hz)	δ _C / ppm	δ _H / ppm, (J / Hz)	δ _C / ppm	δ _H / ppm, (J / Hz)
1	36.6	1.78, 1.28, m	37.1	1.67, 2.03, m	31.9	1.56–1.52 (2H), m
2	25.3	1.67, m	35.6	2.44, 2.61, m	24.2	1.70, 1.97, m
3	82.6	4.45, dd (9.3, 7.1)	220.6	-	79.9	4.69, dd (3.6, 2.0)
4	39.0	-	48.9	-	38.1	-
5	52.2	1.16, m	52.8	1.67, m	46.9	1.55, m
6	19.3	1.73, 1.57, m	20.7	1.69–1.65 (2H), m	19.3	1.55, 1.67, m
7	27.7	2.08, m	27.5	2.07, 2.12, m	27.3	2.11–2.08 (2H), m
8	136.2	-	133.2	-	136.4	-
9	135.7	-	137.4	-	134.6	-
10	38.3	-	38.1	-	38.1	-
11	21.7	2.05, 1.98, m	34.6	2.09, 2.68, m	34.5	2.10, 2.64, m
12	30.3	1.81, 1.47, m	73.7	4.01, d (8.0)	73.8	4.00, d (8.0)
13	47.1	-	50.8	-	50.7	-
14	49.4	-	51.0	-	50.9	-
15	43.8	2.20, 1.28, m	33.5	1.20, 1.71, m	33.4	1.17, 1.70, m
16	77.9	4.04, dd (7.9, 6.6)	29.1	1.37, 2.04, m	29.1	1.36, 2.03, m
17	57.5	2.08, m	44.0	2.24, m	44.0	2.24, m
18	17.9	0.78, s	17.2	0.67, s	17.1	0.66, s
19	19.7	1.03, s	19.0	1.11, s	19.2	1.04, s
20	49.1	2.38, dt (11.2, 2.6)	37.8	1.43, m	37.8	1.42, m
21	180.6	-	18.1	1.05, d (6.6)	18.0	1.06, d (6.6)
22	32.0	2.04, 1.75, m	35.8	1.26, 1.65, m	35.8	1.27, 1.65, m

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C/H	1 (MeOD-d ₄)		2 (MeOD-d ₄)		3 (MeOD-d ₄)	
	δ_C /ppm	δ_H /ppm, (J/Hz)	δ_C /ppm	δ_H /ppm, (J/Hz)	δ_C /ppm	δ_H /ppm, (J/Hz)
23	33.6	2.07, 1.99, m	33.1	2.04, 2.24, m	33.1	2.04, 2.24, m
24	157.0	-	151.0	-	150.9	-
25	35.2	2.27, sep (6.7)	47.1	3.12, q (7.1)	46.9	3.14, q (7.1)
26	22.4	1.04, d (6.7)	179.0	-	178.8	-
27	22.5	1.02, d (6.7)	17.1	1.26, d (7.1)	17.0	1.27, d (7.1)
28	28.6	0.90, s	27.0	1.09, s	28.3	0.90, s
29	17.1	0.91, s	21.8	1.08, s	22.2	0.97, s
30	25.6	1.13, s	25.4	1.11, s	25.4	1.12, s
31	107.5	4.76, 4.73, brs	111.1	4.89, 4.93 brs	111.2	4.90, 4.93, d (2.0)
3-						
1'	173.0	-			167.9	-
2'	21.3	2.03, s			169.1	-
3'					53.1	3.72, s

TABLE S-II. ¹H- (500 MHz) and ¹³C-NMR (125 MHz) Spectral Data of 4-6

C/H	4 (Pyridine-d ₅)		5 (MeOD-d ₄)		6 (CDCl ₃)	
	δ_C /ppm	δ_H /ppm, (J/Hz)	δ_C /ppm	δ_H /ppm, (J/Hz)	δ_C /ppm	δ_H /ppm, (J/Hz)
1	37.3	2.08, 1.62, m	34.1	1.74, (2H) m	30.9	1.78, 1.65, m
2	35.4	2.72, 2.31, m	30.7	2.33, 1.97, m	26.5	1.98, 1.64, m
3	215.7	-	178.4	-	76.7	3.37, brs
4	48.0	-	147.6	-	38.2	-
5	51.6	1.58, m	48.4	2.20, m	44.1	1.55, t (7.9)
6	24.4	2.11, 5.55, m	25.4	1.77, 1.57, m	23.9	2.02, (2H), m
7	121.2	2.08, m	28.1	2.00, 1.40, m	121.8	5.46, t (3.7)
8	143.4	-	140.4	-	147.0	-
9	145.2	-	131.1	-	143.0	-
10	38.0	-	41.7	-	38.3	-
11	118.2	5.32, m	22.9	2.11, 1.98, m	116.6	5.34, m
12	36.8	2.63, 2.38, m	30.4	1.75, 1.52, m	36.4	2.22, 1.86 m
13	45.6	-	45.4	-	45.4	-
14	49.9	-	51.8	-	49.6	-
15	44.9	2.41, 1.89, d (13)	31.8	1.67, 1.29, m	44.2	2.16, 1.45, m
16	76.9	4.50, dd (7.9, 6.2)	27.2	2.10, 2.05 m	77.4	4.03, dd (7.8, 0.7)
17	58.1	2.84, dd (11.0, 6.2)	48.5	2.10, m	57.3	2.13, m
18	18.1	1.02, s	16.8	0.84, s	17.7	0.61, s
19	22.5	1.10, s	23.0	0.97, s	26.5	1.08, s
20	49.2	2.92, dt (11.0, 3.0)	49.6	2.26, m	48.6	2.13, dt (11.3, 2)
21	179.5	-	180.6	-	180.1	-
22	32.0	2.61, 2.43, m	32.5	1.68, 1.62, m	31.4	2.02, 1.76, m
23	33.8	2.50, 2.36, m	33.3	2.00 (2H) m	33.3	2.10-1.94, (2H) m
24	156.6	-	156.8	-	156.4	-
25	34.6	2.25, sep (6.8)	35.2	2.24, m	34.8	2.24, m
26	22.4	0.97, d (6.8)	22.5	1.02, d (6.6)	22.4	1.00, d (6.7)
27	22.5	0.95, d (6.8)	22.4	1.03, d (6.6)	22.3	1.01, d (6.7)
28	26.2	1.09, s	114.6	4.92, 4.69, brs	28.9	0.94, s
29	22.9	1.02, s	23.6	1.78, s	23.4	0.91, s
30	26.9	1.42, s	25.8	0.99, s	23.2	0.98, s
31	107.5	4.95, 4.81, brs	107.6	4.77, 4.72 brs	107.3	4.73, 4.70, brs

1'	170.9
2'	22.8 2.05, s

TABLE S-III. ¹H- (500 MHz) and ¹³C-NMR (125 MHz) Spectral Data of 7-9

C/H	7 (CDCl ₃ / MeOD-d ₄)		8 (CDCl ₃)		9 MeOD	
	δ _C / ppm	δ _H / ppm, (J/ Hz)	δ _C / ppm	δ _H / ppm, (J/ Hz)	δ _C / ppm	δ _H / ppm, (J/ Hz)
1	29.9	1.58, 1.46, m	36.4	1.95, 1.61, m	31.7	1.74, 1.54, m
2	25.6	1.94, 1.61, m	34.8	2.56, 2.39, m	24.2	1.90, 1.78, m
3	75.8	3.41, m	217.9	-	78.6	4.97, brs
4	37.6	-	47.9	-	37.5	-
5	44.3	1.53, m	47.4	2.11, m	46.5	1.81, m
6	18.1	1.62, 1.51, m	19.6	1.61 (2H), m	18.9	1.67, 1.52, m
7	26.1	2.03, (2H) m	26.5	2.09 (2H), m	26.8	2.12 (2H), m
8	133.1	-	135.2	-	134.2	-
9	134.8	-	133.4	-	135.6	-
10	37.6	-	37.2	-	37.6	-
11	32.6	2.62, 2.09, m	21.2	2.02, (2H), m	35.1	2.76, 2.48, m
12	73.2	3.98, d (8.0)	30.6	1.64, 1.26, m	72.5	4.25, d (7.4)
13	49.6	-	44.5	-	50.5	-
14	49.6	-	49.8	-	50.6	-
15	32.1	1.65, 1.15, m	29.1	1.72, 1.43, m	33.1	1.75, 1.23, m
16	27.8	2.02, 1.35, m	27.3	2.02, 1.38, m	28.8	2.14, 1.43
17	43.0	2.08, m	51.4	1.60, m	43.6	2.67, m
18	16.3	0.62, s	16.3	0.79, s	17.3	0.77, s
19	18.8	0.98, s	18.9	1.11, s	19.4	1.03, s
20	36.2	1.41, m	47.6	2.32, m	37.4	1.50, m
21	17.7	1.02, d (6.5)	182.3	-	18.4	1.30, d (6.4)
22	34.3	1.64, 1.24, m	31.2	1.70, (2H), m	35.6	1.89, 1.50, m
23	31.8	2.20, 2.01, m	32.2	2.02, (2H), m	33.0	2.60, 2.34, m
24	149.2	-	155.4	-	151.2	-
25	45.8	3.12, q (7.0)	34.0	2.22, sep (6.9)	47.0	3.50, q (7.0)
26	177.9	-	22.1	1.01, d (6.9)	177.5	-
27	16.3	1.28, d (7.0)	22.0	1.02, d (6.9)	17.6	1.54, d (7.0)
28	28.0	0.97, s	26.4	1.09, s	28.8	1.03, s
29	22.2	0.87, s	21.5	1.06, s	27.5	0.91, s
30	24.4	1.07, s	24.6	0.91, s	25.7	1.40, s
31	110.5	4.94, 4.90, brs	107.1	4.77, 4.69, brs	110.9	4.90, 4.93, d (2.0)
3-						
1'					171.8	-
2'					46.9	3.02, 2.98, d (14.8)
3'					70.4	-
4'					46.5	3.07, 3.04, d (14.8)
5'					172.5	-
6'					51.8	3.64, s
3'-						
Me					28.9	1.67, s

TABLE S-IV. ¹H- (500 MHz) and ¹³C-NMR (125 MHz) Spectral Data of **10-12**

C/H	10 (CDCl ₃)		11 (MeOD-d ₄ : CDCl ₃ / 20 : 1)		12 (CDCl ₃)	
	δ_C / ppm	δ_H / ppm, (J / Hz)	δ_C / ppm	δ_H / ppm, (J / Hz)	δ_C / ppm	δ_H / ppm, (J / Hz)
1	39.1	1.66, 0.91, m	31.0	1.47, 1.41, m	35.5	1.83, 1.51, m
2	27.6	1.58, (2H) m	23.5	1.84, 1.62, m	24.3	1.72, 1.68, m
3	79.2	3.19, dd (11.5, 4.7)	78.1	4.67, brs	81.0	4.50, dd (11.4, 4.4)
4	38.9	-	37.0	-	37.8	-
5	55.5	0.69, d (9.6)	45.5	1.53, m	49.4	1.20, dd (11.3, 4.2)
6	18.5	1.53, 1.40, m	18.1	1.61, 1.48, m	22.9	2.07, (2H), m
7	34.4	1.40, m	26.3	2.08, 1.98, m	120.7	5.45, d (5.9)
8	41.1	-	134.1	-	141.9	-
9	50.9	1.27, 1.23, m	134.9	-	145.5	-
10	37.5	-	37.1	-	37.4	-
11	21.0	1.41, 1.21, m	20.7	2.04, 1.97, m	116.4	5.31, d (5.9)
12	25.4	1.64, 1.04, m	29.2	1.82, (2H), m	35.5	2.25, 1.98 m
13	37.4	1.65, m	46.3	-	44.8	-
14	42.9	-	48.5	-	48.8	-
15	27.3	-	42.9	2.20, 1.31, m	43.4	2.20, 1.50, m
16	29.4	1.93, 1.21, m	77.8	4.15, dd (8.7, 6.2)	76.9	4.03, dd (7.9, 6.8)
17	48.0	2.39, m	57.0	2.15, m	57.1	2.17, m
18	48.0	2.39, m	17.6	0.76, s	17.3	0.60, s
19	49.0	1.64, 1.58, m	19.1	0.98, s	22.8	0.98, s
20	150.7	-	46.5	2.49, dt (11.0, 2.3)	46.7	2.44, dt (10.6, 2.6)
21	30.0	-	179.8	-	178.7	-
22	34.2	1.86, 1.04, m	30.8	1.98, 1.84, m	30.6	1.96, 1.81, m
23	28.2	0.97, s	32.4	2.10, 2.02, m	32.4	2.08, 2.02, m
24	15.6	0.76, s	155.2	-	155.4	-
25	16.3	0.83, s	34.0	2.24, sep (7.0)	33.9	2.24, m
26	16.2	0.98, s	22.0	1.02, d (6.2)	21.9	1.02, d (6.4)
27	15.0	1.05, s	22.1	1.02, d (6.2)	22.0	1.01, d (6.4)
28	60.8	3.80, 3.33, d	27.8	0.88, s	28.2	0.88, s
29	109.8	4.68, 4.58, m	22.0	0.92, s	17.1	0.95, s
30	19.3	1.68, s	25.7	1.19, s	26.2	1.09, s
31			107.2	4.79, 4.73, brs	107.0	4.76, 4.72, brs
3-						
1'			171.1	-	171.4	-
2'			21.6	2.05, s	21.4	2.06, s

TABLE S-V. Incidence of MN, distribution of MN per cells, CBPI, and frequency of MN measurement (mean \pm SD) in cell cultures of human lymphocytes treated with different concentration of **1-12**

Tested compounds	c / $\mu\text{g ml}^{-1}$	Number of MN / 1000 BN cell	Contribution of BN cell with MN, %	Number of MN/BN cell	CBPI	Frequency of MN, %
Control		26.33 \pm 0.28	2.15 \pm 0.07	1.19 \pm 0.05	1.67 \pm 0.03	100
Amifos. - 1.0		21.25 \pm 0.45 ^a	1.74 \pm 0.09	1.22 \pm 0.06	1.66 \pm 0.01	80.7
MMC - 0.2		34.06 \pm 0.78 ^{a,b}	2.95 \pm 0.13	1.16 \pm 0.03	1.69 \pm 0.06	129.4
1	1.0	17.66 \pm 0.63 ^{a,b,c}	1.50 \pm 0.03	1.17 \pm 0.03	1.71 \pm 0.09	67.1
	2.0	16.14 \pm 0.56 ^{a,b,c}	1.40 \pm 0.03	1.15 \pm 0.05	1.65 \pm 0.06	61.3
	4.0	16.91 \pm 0.60 ^{a,b,c}	1.50 \pm 0.05	1.12 \pm 0.03	1.64 \pm 0.06	64.2
2	1.0	16.71 \pm 0.76 ^{a,b,c}	1.42 \pm 0.15	1.19 \pm 0.09	1.60 \pm 0.02	63.5
	2.0	14.82 \pm 1.33 ^{a,b,c}	1.27 \pm 0.08	1.17 \pm 0.06	1.65 \pm 0.03	56.3

	4.0	15.83 ± 0.79 ^{a,b,c}	1.32 ± 0.07	1.20 ± 0.03	1.66 ± 0.04	60.1
	1.0	18.43 ± 0.45 ^{a,b,c}	1.55 ± 0.04	1.19 ± 0.04	1.66 ± 0.03	70.0
3	2.0	17.22 ± 0.48 ^{a,b,c}	1.43 ± 0.02	1.20 ± 0.03	1.70 ± 0.05	65.4
	4.0	17.89 ± 0.52 ^{a,b,c}	1.57 ± 0.07	1.14 ± 0.05	1.61 ± 0.02	67.9
	1.0	21.73 ± 0.38 ^{a,c}	1.90 ± 0.04	1.14 ± 0.01	1.65 ± 0.02	82.5
4	2.0	19.48 ± 0.42 ^{a,c}	1.68 ± 0.06	1.17 ± 0.06	1.66 ± 0.03	74.0
	4.0	20.79 ± 0.27 ^{a,c}	1.59 ± 0.06	1.31 ± 0.05	1.64 ± 0.02	79.0
	1.0	19.28 ± 0.50 ^{a,c}	1.61 ± 0.06	1.20 ± 0.08	1.71 ± 0.09	73.2
5	2.0	17.83 ± 0.92 ^{a,b,c}	1.50 ± 0.06	1.19 ± 0.02	1.66 ± 0.02	67.7
	4.0	18.76 ± 0.53 ^{a,b,c}	1.68 ± 0.09	1.12 ± 0.04	1.63 ± 0.02	71.2
	1.0	20.02 ± 0.39 ^{a,c}	1.66 ± 0.09	1.21 ± 0.04	1.97 ± 0.33	76.0
6	2.0	18.75 ± 0.83 ^{a,b,c}	1.57 ± 0.04	1.20 ± 0.04	1.64 ± 0.02	71.2
	4.0	19.30 ± 0.72 ^{a,c}	1.71 ± 0.09	1.22 ± 0.04	1.63 ± 0.01	73.3
	1.0	18.01 ± 0.52 ^{a,b,c}	1.57 ± 0.03	1.13 ± 0.01	1.65 ± 0.01	68.4
7	2.0	17.33 ± 0.45 ^{a,b,c}	1.59 ± 0.11	1.10 ± 0.06	1.69 ± 0.09	65.8
	4.0	17.70 ± 0.80 ^{a,b,c}	1.53 ± 0.04	1.16 ± 0.02	1.70 ± 0.04	67.2
	1.0	18.63 ± 0.49 ^{a,b,c}	1.54 ± 0.08	1.21 ± 0.03	1.90 ± 0.09	70.8
8	2.0	17.90 ± 0.51 ^{a,b,c}	1.58 ± 0.09	1.14 ± 0.05	1.62 ± 0.01	68.0
	4.0	18.33 ± 0.57 ^{a,b,c}	1.51 ± 0.07	1.22 ± 0.03	1.72 ± 0.08	69.6
	1.0	17.13 ± 0.37 ^{a,b,c}	1.40 ± 0.05	1.21 ± 0.05	1.61 ± 0.01	65.1
9	2.0	16.42 ± 0.64 ^{a,b,c}	1.30 ± 0.05	1.26 ± 0.06	1.68 ± 0.03	62.4
	4.0	16.81 ± 0.46 ^{a,b,c}	1.42 ± 0.03	1.18 ± 0.06	1.61 ± 0.02	63.8
	1.0	22.00 ± 0.63 ^{a,c}	1.78 ± 0.07	1.22 ± 0.01	1.67 ± 0.02	83.5
10	2.0	21.37 ± 0.40 ^{a,c}	1.77 ± 0.05	1.19 ± 0.02	1.66 ± 0.03	81.2
	4.0	21.58 ± 0.45 ^{a,c}	1.79 ± 0.05	1.20 ± 0.02	1.62 ± 0.02	82.0
	1.0	19.78 ± 0.30 ^{a,c}	1.65 ± 0.01	1.13 ± 0.04	1.75 ± 0.07	75.1
11	2.0	19.23 ± 0.17 ^{a,c}	1.67 ± 0.06	1.16 ± 0.04	1.73 ± 0.08	73.0
	4.0	19.54 ± 0.70 ^{a,c}	1.64 ± 0.07	1.20 ± 0.09	1.62 ± 0.03	74.2
	1.0	20.88 ± 0.61 ^{a,c}	1.71 ± 0.12	1.22 ± 0.10	1.65 ± 0.01	79.3
12	2.0	20.44 ± 0.39 ^{a,c}	1.74 ± 0.06	1.17 ± 0.04	1.68 ± 0.03	77.6
	4.0	20.74 ± 0.73 ^{a,c}	1.73 ± 0.02	1.19 ± 0.05	1.67 ± 0.01	78.8

Number of MN/1000 BN cell - incidence of micronuclei in 1000 binucleated cells (examined for each concentration); Contribution of BN cell with MN: binucleated cells with micronuclei; Number of MN/BN cell incidence of micronuclei in binucleated cells; CBPI- cytokinesis-block proliferation index. Frequency of MN: incidence of MN present like share of control groups in cell cultures of human lymphocytes treated with different concentration of triterpenes

The statistical significance of difference between the data pairs was evaluated by analysis of variance (One-way ANOVA) followed by the Tukey test. Statistically difference was considered significant at $p < 0.01$.

^aCompared with control groups, statistically significant difference $p < 0.01$.

^bCompared with amifostine – WR 2721, statistically significant difference $p < 0.01$.

^cCompared with mitomycin – C, statistically significant difference $p < 0.01$. 1