### **Supporting Information**

#### Rec. Nat. Prod. 17:2 (2023) 372-376

## Cytotoxic Constituents from the Rhizomes of

### Monstera deliciosa

# Marwa Elsbaey<sup>1</sup>, Kadria F. M. Ahmad<sup>1</sup>, Fathy A. Behery<sup>1,2\*</sup>, Mohamed MA. Amer<sup>1</sup> and Mohamed-Farid I. Lahloub<sup>1</sup>

<sup>1</sup> Department of Pharmacognosy, Faculty of Pharmacy, Mansoura University, Mansoura 35516, Egypt

<sup>2</sup> Department of Pharmacy, College of Pharmacy, Riyadh Elm University, Riyadh 11681, Saudi Arabia

Table of Contents	Page
Figure S1: Scheme for chromatographic fractionation of the pet. ether extract & separation of	3
<b>9</b> ( $\beta$ -sitostertyl palmitate) and <b>10</b> ( $\beta$ -sitosterol).	
Figure S2: Scheme for chromatographic separation of 2 (propiosyringone), 4 (sesartemin), 5	4
(yangambin), 11 (7-oxo- $\beta$ -sitosterol-3-O- $\beta$ -D-glucopyranoside)-6'-palmitate), 12	
$(5\alpha, 8\alpha$ -epi-dioxyergosta-6, 22-dien-3 $\beta$ -ol), and <b>13</b> (oleanolic acid).	
Figure S3: Scheme for chromatographic fractionation of the methylene chloride extract	5
Figure S4: Scheme for chromatographic separation of compounds $1$ (propiosyringone- $\beta$ -D-	6
glucopyranoside), <b>3</b> (ceplignan), <b>6</b> (syringaresinol), <b>7</b> (protocatechuic aldehyde),	
8 (3-methyl thio-indole) and 14 (9, 12, 13-trihydroxy-10-octadecenoic acid).	
<b>Figure S5:</b> <sup>1</sup> H-NMR (400 MHz, DMSO- $d_6$ ) spectrum of <b>1</b> (propiosyringone- $\beta$ -D-	7
glucopyranoside)	
<b>Figure S6:</b> APT (100 MHz, DMSO- <i>d</i> <sub>6</sub> ) spectrum of <b>1</b> (propiosyringone-β-D-glucopyranoside)	8
<b>Figure S7:</b> Positive ESI/TOF-MS spectrum of <b>1</b> (propiosyringone-β-D-glucopyranoside)	9
Figure S8: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of <b>2</b> (propiosyringone)	10
Figure S9: APT (100 MHz, CDCl <sub>3</sub> ) spectrum of 2 (propiosyringone)	11
Figure S10: <sup>1</sup> H-NMR (400 MHz, CD <sub>3</sub> OD) spectrum of <b>3</b> (ceplignan)	12
Figure S11: <sup>13</sup> C-NMR (100 MHz, CD <sub>3</sub> OD) spectrum of <b>3</b> (ceplignan)	13
<b>Figure S12:</b> HMBC spectrum of <b>3</b> (ceplignan) (From $\delta_C$ 40 ppm to $\delta_C$ 175 ppm)	14
Figure S13: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of 4 (sesartemin)	15
Figure S14:APT (100 MHz, CDCl <sub>3</sub> ) spectrum of 4 (sesartemin)	16
Figure S15: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of 5 (yangambin)	17
Figure S16: APT (100 MHz, CDCl <sub>3</sub> ) spectrum of 5 (yangambin)	18
Figure S17: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of 6 (syringaresinol)	19
Figure S18: <sup>13</sup> C-NMR (100 MHz, CDCl <sub>3</sub> ) spectrum of 6 (syringaresinol)	20
Figure S19: <sup>1</sup> H-NMR (400 MHz, CD <sub>3</sub> OD) spectrum of 7 (protocatechuic aldehyde)	21
Figure S20: <sup>13</sup> C-NMR (100 MHz, CD <sub>3</sub> OD) spectrum of 7 (protocatechuic aldehyde)	22
<b>Figure S21:</b> HMBC spectrum of <b>7</b> (protocatechuic aldehyde) (From $\delta_{\rm C}$ 90 ppm to $\delta_{\rm C}$ 200	23
ppm)	

Figure S22: <sup>1</sup> H-NMR (400 MHz, CD <sub>3</sub> OD) spectrum of 8 (3-methyl thio-indole)	24
Figure S23: <sup>13</sup> C-NMR (100 MHz, CD <sub>3</sub> OD) spectrum of 8 (3-methyl thio-indole)	25
<b>Figure S24:</b> HSQC spectrum of <b>8</b> (3-methyl thio-indole) (From $\delta_C$ 00 ppm to $\delta_C$ 140 ppm)	26
<b>Figure S25:</b> HMBC spectrum of <b>8</b> (3-methyl thio-indole) (From $\delta_c$ 95 ppm to $\delta_c$ 160 ppm)	27
Figure S26: Negative ESI/EMS spectrum of 8 (3-methyl thio-indole)	28
Figure S27: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of 9 ( $\beta$ -sitostertyl palmitate)	29
Figure S28: APT (100 MHz, CDCl <sub>3</sub> ) spectrum of 9 (β-sitostertyl palmitate)	30
Figure S29: <sup>1</sup> H-NMR (400 MHz, CDCl <sub>3</sub> ) spectrum of 11 (7-oxo- β-sitosterol-3-O-β-D-	31
glucopyranoside)-6'-palmitate)	
Figure S30: APT (100 MHz, CDCl <sub>3</sub> ) spectrum of 11 (7-oxo- β-sitosterol-3-O-β-D-	32
glucopyranoside)-6'-palmitate)	
<b>Figure S31:</b> Positive ESI/EMS spectrum of <b>11</b> (7-oxo- β-sitosterol-3-O-β-D-	33
glucopyranoside)-6'-palmitate)	
<b>Figure S32:</b> Some possible fragmentation patterns of <b>11</b> (7-0x0- β-sitosterol-3-O-β-D-	34
glucopyranoside)-6'-palmitate)	6.
<b>Figure S33:</b> <sup>1</sup> H-NMR (400 MHz CDCl <sub>2</sub> ) spectrum of <b>12</b> (5a, 8a-epi-dioxyergosta-6, 22-dien-	35
3β-ol)	00
Figure S34: APT (100 MHz CDCl <sub>2</sub> ) spectrum of 12 (5a, 8a-epi-dioxyergosta-6, 22-dien-38-	36
	50
<b>Figure S35:</b> <sup>1</sup> H-NMR (400 MHz_CDCl <sub>2</sub> ) spectrum of <b>13</b> (oleanolic acid)	37
Figure S36: APT (100 MHz, CDCl <sub>2</sub> ) spectrum of <b>13</b> (oleanolic acid)	38
Figure S30: $^{1}$ H-NMR (500 MHz DMSO- $d_{c}$ ) spectrum of 14 (9–12–13-trihydroxy-10-	39
octadecenoic acid)	57
Figure S38: $\Delta PT$ (125 MHz DMSO-dc) spectrum of 14 (9, 12, 13-tribydroxy-10-octadecenoic	40
acid)	-0
<b>Figure S30:</b> Negative ESI/EMS spectrum of <b>14</b> (9, 12, 13-tribydroxy-10-octadecenoic acid)	<i>4</i> 1
<b>Table S1:</b> IN NMR and APT spectral data of 1 (propiosuringone & D gluconvranoside) 2	41 42
(propiosyringone) and 3 (caplignan)	42
Table S2: <sup>1</sup> H NMP and APT spectral data of $A$ (constraint) and $5$ (vangembin)	13
<b>Table S2.</b> II-Wilk and AFT spectral data of <b>4</b> (sesare finite) and <b>5</b> (yanganion). <b>Table S2:</b> <sup>1</sup> U and <sup>13</sup> C NIMP spectral data of <b>6</b> (suring argsing)). <b>7</b> (protocotochylic ald abuda )	43
<b>Table 55:</b> If and C-INVIK spectral data of $0$ (syningatesinon), 7 (protocatechnic aldenyde), and $8$ (2 mothyl this indels)	44
and o (5-methyl mio-muole). Table S4. 14 MMD (400 MHz) and ADT (100 MHz) spectral data of 0 (6 sitestartyl palmitata)	15
Table S4: "H-NMR (400 MHZ) and APT (100 MHZ) spectral data of 9 (p-shostertyl panintale).	43
<b>Table 55:</b> "I-ININK and APT spectral data of 11 (7-0x0- p-sitosteroi-5-0-p-D-	40
giucopyranosiue)-o-paininate).	47
<b>Table S0:</b> "H-NMR and APT spectral data of $12$ ( $5\alpha$ , $8\alpha$ -epi-dioxyergosta-6, 22-dien-5p-6i).	4/
<b>Table S7:</b> <sup>1</sup> H-NMK and AP1 spectral data of <b>13</b> (oleanolic acid). Table S9: <sup>1</sup> H $^{13}$ C N (D) (S9) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	48
Table 58: 'H-, "C-NMR, HSQC, and HMBC spectral data of 14 (9, 12, 13-trihydroxy-10-	49
octadecenoic acid).	50
SI:MII Assay	50
<b>Figure S40:</b> Calculated IC <sub>50</sub> ( $\mu$ M) for the <i>in vitro</i> cytotoxicity of <b>1-14</b>	51
<b>Figure S41:</b> The log concentration- cell viability graph of 5FU and <b>6</b> (syringaresinol)	51

 $\ensuremath{\textcircled{O}}$  2022 ACG Publications. All rights reserved.



Figure S1: Scheme for chromatographic fractionation of the pet. ether extract & separation of 9 ( $\beta$ -sitostertyl palmitate) and 10 ( $\beta$ -sitosterol).



Figure S2: Scheme for chromatographic separation of 2 (propiosyringone), 4 (sesartemin), 5 (yangambin), 11 (7-oxo- β-sitosterol-3-O-β-D-glucopyranoside)-6'-palmitate), 12 (5α, 8α-epi-dioxyergosta-6, 22-dien-3β-ol), and 13 (oleanolic acid).



Figure S3: Scheme for chromatographic fractionation of the methylene chloride extract



Figure S4: Scheme for chromatographic separation of compounds 1(propiosyringone-β-D-glucopyranoside), 3 (ceplignan), 6 (syringaresinol), 7 (protocatechuic aldehyde ), 8 (3-methyl thio-indole) and 14 (9, 12, 13-trihydroxy-10-octadecenoic acid).



**Figure S5:**<sup>1</sup>H-NMR (400 MHz, DMSO-*d*<sub>6</sub>) spectrum of **1** (propiosyringone-β-D-glucopyranoside)



**Figure S6:** APT (100 MHz, DMSO-*d*<sub>6</sub>) spectrum of **1** (propiosyringone-β-D-glucopyranoside)



Figure S7: Positive ESI/TOF-MS spectrum of 1 (propiosyringone- $\beta$ -D-glucopyranoside)

![](_page_9_Figure_0.jpeg)

Figure S8:<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 2 (propiosyringone)

![](_page_10_Figure_0.jpeg)

Figure S9: APT (100 MHz, CDCl<sub>3</sub>) spectrum of 2 (propiosyringone)

![](_page_11_Figure_0.jpeg)

Figure S10:<sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD) spectrum of 3 (ceplignan)

![](_page_12_Figure_0.jpeg)

Figure S11:<sup>13</sup>C-NMR (100 MHz, CD<sub>3</sub>OD) spectrum of **3** (ceplignan)

![](_page_13_Figure_0.jpeg)

![](_page_14_Figure_0.jpeg)

Figure S13:<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 4 (sesartemin)

![](_page_15_Figure_0.jpeg)

Figure S14:APT (100 MHz, CDCl<sub>3</sub>) spectrum of 4 (sesartemin)

![](_page_16_Figure_0.jpeg)

Figure S15:<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 5 (yangambin)

![](_page_17_Figure_0.jpeg)

Figure S16: APT (100 MHz, CDCl<sub>3</sub>) spectrum of 5 (yangambin)

![](_page_18_Figure_0.jpeg)

Figure S17:<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 6 (syringaresinol)

![](_page_19_Figure_0.jpeg)

Figure S18:<sup>13</sup>C-NMR (100 MHz, CDCl<sub>3</sub>) spectrum of 6 (syringaresinol)

![](_page_20_Figure_0.jpeg)

Figure S19:<sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD) spectrum of 7 (protocatechuic aldehyde)

![](_page_21_Figure_0.jpeg)

Figure S20:<sup>13</sup>C-NMR (100 MHz, CD<sub>3</sub>OD) spectrum of 7 (protocatechuic aldehyde)

![](_page_22_Figure_0.jpeg)

Figure S21: HMBC spectrum of 7 (protocatechuic aldehyde)

![](_page_23_Figure_0.jpeg)

Figure S22:<sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD) spectrum of 8 (3-methyl thio-indole)

![](_page_24_Figure_0.jpeg)

Figure S23:<sup>13</sup>C-NMR (100 MHz, CD<sub>3</sub>OD) spectrum of 8 (3-methyl thio-indole)

![](_page_25_Figure_0.jpeg)

Figure S24: HSQC spectrum of 8 (3-methyl thio-indole)

![](_page_26_Figure_0.jpeg)

Figure S25: HMBC spectrum of 8 (3-methyl thio-indole)

![](_page_27_Figure_0.jpeg)

Figure S26: Negative ESI/EMS spectrum of 8 (3-methyl thio-indole)

![](_page_28_Figure_0.jpeg)

**Figure S27:**<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of **9** (β-sitostertyl palmitate)

![](_page_29_Figure_0.jpeg)

Figure S28: APT (100 MHz, CDCl<sub>3</sub>) spectrum of 9 ( $\beta$ -sitostertyl palmitate)

![](_page_30_Figure_0.jpeg)

**Figure S29:**<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of **11** (7-oxo- β-sitosterol-3-O-β-D-glucopyranoside)-6'-palmitate)

![](_page_31_Figure_0.jpeg)

**Figure S30:** APT (100 MHz, CDCl<sub>3</sub>) spectrum of **11** (7-oxo- β-sitosterol-3-O-β-D-glucopyranoside)-6'-palmitate)

![](_page_32_Figure_0.jpeg)

**Figure S31:** Positive ESI/EMS spectrum of **11** (7-oxo- β-sitosterol-3-O-β-D-glucopyranoside)-6'-palmitate)

![](_page_33_Figure_0.jpeg)

Figure S32: Some possible fragmentation patterns of 11 (7-oxo- $\beta$ -sitosterol-3-O- $\beta$ -D-glucopyranoside)-6'-palmitate)

![](_page_34_Figure_0.jpeg)

Figure S33:<sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 12 (5 $\alpha$ , 8 $\alpha$ -epi-dioxyergosta-6, 22-dien-3 $\beta$ -ol)

![](_page_35_Figure_0.jpeg)

**Figure S34:** APT (100 MHz, CDCl<sub>3</sub>) spectrum of **12** (5α, 8α-epi-dioxyergosta-6, 22-dien-3β-ol)

![](_page_36_Figure_0.jpeg)

Figure S35: <sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>) spectrum of 13 (oleanolic acid)

![](_page_37_Figure_0.jpeg)

Figure S36: APT (100 MHz, CDCl<sub>3</sub>) spectrum of 13 (oleanolic acid)

![](_page_38_Figure_0.jpeg)

**Figure S37:** <sup>1</sup>H-NMR (500 MHz, DMSO-*d*<sub>6</sub>) spectrum of **14** (9, 12, 13-trihydroxy-10-octadecenoic acid)

![](_page_39_Figure_0.jpeg)

**Figure S38:** APT (125 MHz, DMSO-*d*<sub>6</sub>) spectrum of **14** (9, 12, 13-trihydroxy-10-octadecenoic acid)

![](_page_40_Figure_0.jpeg)

Figure S39: Negative ESI/EMS spectrum of 14 (9, 12, 13-trihydroxy-10-octadecenoic acid)

(proprosyringone) and 5 (cepinghan).			1	•	3	
#		АРТ		<u>а</u> лрт	<u>1</u> н_мид	
#	$(400 \text{ MH}_2)$	AIII	(400	AI I (100	$(400 \text{ MH}_2)$	$(100 \text{ MH}_2)$
	$(400 \text{ MHZ}, DMSO-d_{2})$	$(100 \text{ MHZ}, DMSO_d)$	(400 MHz	MHz	$(400 \text{ MHZ}, CD_2 \text{OD})$	$(100 \text{ MHZ}, CD_2 \text{OD})$
	$DWDO-u_0)$	$DNDO-u_0)$	$CDCl_2$	$CDCl_2$	$CD_3OD)$	$CD_3OD)$
1		131.7		128.1		134.1
2	7 25 (s. 2H)	106.2	7 18 (2H	105 5	6 94 (H	110.6
2	,.20 (3, 211)	100.2	s)	100.0	br.s)	11010
3		152.3		147.0		149.3
4		138.5		139.9		147.9
5		152.3		147.0	6.77 (H, d,	116.3
-					J=8.2)	
6	7.25 (s, 2H)	106.2	7.18 (2H,	105.5	6.83 (H, <i>d</i> ,	119.9
			<i>s</i> )		<i>J</i> =8.1)	
7		199.2		200.0	5.4 (H, <i>d</i> ,	90.3
					<i>J</i> =6.3)	
8	7.25 (s, 2H)	30.9	2.89 (2H,	31.3	3.55 (H, <i>d</i> ,	54.7
0	1.07 (211)	0.0	<i>q</i> )	0.5	J=5.8)	
9	1.07 (3H, t)	8.2	1.14 (3H,	8.5	3.86 (9a),	64.7
OCH	2.70 (GU s)	560	t)	ECA	3.83 (9b)	ECE
UCH3	5.79 (оп, s)	30.9	3.80 (оп,	30.4	5.82 (51, 8)	30.3
1'	5 07 (H d	101.9	3)			**
I	J=7.6	101.9				
2'	3.00-3.59	74.1			7.62 (H.	120.8
-					br.s)	
3'	3.00-3.59	76.6				130.4
4'	3.00-3.59	69.8				153.8.
5'	3.00-3.59	77.3				145.3
6'	H-6'a*	60.7			7.56 (H,	115.4
	H-6'b*				br.s)	
	3.57 (H, dd,					
	<i>J</i> =12.3, 6.25)					
7'						170.1
5'-					3.89 (3H, s)	56.8
OCH <sub>3</sub>						

Table S1: <sup>1</sup>H-NMR and APT spectral data of 1 (propiosyringone-β-D-glucopyranoside), 2 (propiosyringone) and **3** (ceplignan).

\*H-6'a should appear at  $\delta$  3.84 (Güvenalp and Demirezer, 2005) but it is masked by the (OCH<sub>3</sub>) signal, H-6'b should appear at  $\delta$  4.20 (H, *dd*) [1] instead it appeared at  $\delta$  4.31 (H, *t*). \*\* Signal didn't appear (should appear at 125.2, [2]).

	4			5			
#	<sup>1</sup> H-NMR	APT	#	<sup>1</sup> H-NMR	APT		
	(400 MHz,	(100 MHz,		(400 MHz,	(100 MHz,		
	CDCl <sub>3</sub> )	CDCl <sub>3</sub> )		CDCl <sub>3</sub> )	CDCl <sub>3</sub> )		
1		135.5	1,1'		136.8		
2	6.49 (H, br.s)	100.0	2, 6, 2', 6'	6.45 (4H, s)	102.7		
3		149.0	3, 5, 3', 5'		153.4		
4		134.6	4,4'		137.4		
5		143.5	7, 7'	4.72 (2H, d)	86.0		
6	6.51 (H, br.s)	105.5	8, 8'	3.08 (2H, <i>m</i> )	54.2		
7	4.69 (H, <i>d</i> )	85.9	9, 9'	α 4.28 (2Η,	72.0		
				dd)			
				β 3.92 (2H,			
				dd)			
8	3.04 (H, <i>m</i> )	54.2	3,5, 3',5' OCH <sub>3</sub>	3.84(12H, <i>s</i> )	56.2		
9	α 3.86-3.88 (Η,	71.7	4,4' OCH3	3.80 (6H,s)	60.9		
	dd)						
	β 4.21-4.27 (H,						
	dd )						
1'		136.7					
2', 6'	6.53 (2H, <i>s</i> )	102.6					
3', 5'		153.2					
4'		137.1					
7'	4.69 (H, <i>d</i> )	85.8					
8'	3.04 (H, <i>m</i> )	54.2					
9'	α 3.86-3.88 (H,	71.8					
	dd)						
	$\beta$ 4.21-4.2/(H,						
	aa)	101 4					
	3.92(2H,S)	101.4 56.6					
	э.Уэ (эп,s) э.85 (эц s)	50.0 60.7					
4-00H3	3.82 (5H,5)	56.0					
осн <sub>2</sub>	5.00 (011,5)	50.0					

Table S2: <sup>1</sup>H-NMR and APT spectral data of 4 (sesartemin) and 5 (yangambin).

	6			7			:	8
#	<sup>1</sup> H-NMR	<sup>13</sup> C-	#	<sup>1</sup> H-NMR	<sup>13</sup> C-NMR	#	<sup>1</sup> H-NMR	<sup>13</sup> C-NMR
	(400	NMR		(400	(100		(400	(100
	MHz,	(100		MHz,	MHz,		MHz,	MHz,
	CDCl <sub>3</sub> )	MHz,		CD <sub>3</sub> OD)	CD <sub>3</sub> OD)		CD <sub>3</sub> OD)	CD <sub>3</sub> OD)
		CDCl <sub>3</sub> )						
1,1'		132.0	1		130.9	2	7.84 (H,	133.3
							<i>s</i> )	
2, 6, 2',	6.57 (4H,	102.6	2	7.29 (H,	115.9	3		108.7
6'	<i>s</i> )			<i>s</i> )				
3, 5, 3',		147.1	3		147.3	3a		127.5
5'								
4,4'		134.2	4		153.8	4	7.96 (H,	121.9
							<i>d</i> , <i>J</i> =7.3)	
7, 7'	4.72 (2H,	86.1	5	6.90 (H,	116.3	5	7.08 (2H,	122.2
	<i>d</i> )			<i>d</i> , <i>J</i> =7.3)			dd)	
8, 8'	3.1 (2H,	54.2	6	7.30 (H,	126.5	6	7.08 (2H,	123.5
	<i>m</i> )			<i>d</i> , <i>J</i> =8.6)			dd)	
9, 9'	α 4.27	71.7	7	9.86 (H,	193.2	7	7.33 (H,	112.8
	(2H, <i>br</i> .)			<i>s</i> )			<i>d</i> , <i>J</i> =8.4)	
	β 3.90							
	(2H) *							
3,5,	3.90	56.3				7a		138.1
3',5'	(12H, s) *							
OCH <sub>3</sub>								
4, 4'	5.56(2H,					8	1.2 (3H,	30.7
OH	<i>s</i> )						s)	

**Table S3:** <sup>1</sup>H and <sup>13</sup>C-NMR spectral data of **6** (syringaresinol), **7** (protocatechuic aldehyde ), and **8** (3-methyl thio-indole).

The chemical shift ( $\delta$ ) is expressed in ppm and coupling constants (*J*) in Hz \* 9 $\beta$ , 9' $\beta$  protons (2H,  $\delta$  3.90) are masked by the methoxy protons (12H,  $\delta$  3.90), they appear collectively at  $\delta$  3.90 (14H, s)

_					
#	<sup>1</sup> H-NMR	APT	#	<sup>1</sup> H-NMR	APT
	(400 MHz,	(100 MHz,		(400 MHz, CDCl <sub>3</sub> )	(100 MHz,
	CDCl <sub>3</sub> )	CDCl <sub>3</sub> )			CDCl <sub>3</sub> )
1		36.9	21	0.9 (3H, <i>d</i> )	18.7
2		27.7	22		33.9
3	4.5 (H, <i>m</i> )	73.9	23		26.1
4	2.3 (2H, <i>m</i> )	38.1	24		45.8
5		139.6	25		29.2
6	5.3 (H, br. <i>d</i> )	122.6	26	0.75-0.92	19.2
7		32.0	27	0.75-0.92	19.7
8		31.9	28		23.0
9		50.0	29	0.75-0.92	11.8
10		36.7	1'		173.8
11		21.0	2'	2.25 (2H <i>t</i> , <i>J</i> =7.8)	34.7
12		39.7	3'	1.57 (2H, <i>m</i> )	25.0
13		42.3	4'-	1.21-1.31 (20 H,	29.2-29.7
			13'	br. <i>s</i> )	
14		56.6	14'		31.9
15		24.2	15'		22.7
16		27.7	16'	0.86 (3H, <i>t</i> , <i>J</i> =6.4)	14.0
17		56.0			
18	0.66 (3H, <i>s</i> )	11.9			
19	0.99 (3H, <i>s</i> )	18.9			
20		36.3			

Table S4: <sup>1</sup>H-NMR (400 MHz) and APT (100 MHz) spectral data of 9 (β-sitostertyl palmitate).

o pan	maile).				
#	<sup>1</sup> H-NMR	APT	#	<sup>1</sup> H-NMR	APT
	(400 MHz,	(100 MHz,		(400 MHz,	(100 MHz,
	CDCl <sub>3</sub> )	CDCl <sub>3</sub> )		CDCl <sub>3</sub> )	CDCl <sub>3</sub> )
1		36.4	22		34.3
2		32.0	23		26.3
3		78.4	24		45.8
4		42.9	25		29.2
5		164.7	26	0.79 (3H, <i>d</i> ,	19.8
				<i>J</i> =7.3)	
6	5.69 (H, s)	126.3	27	0.78 (3H, <i>d</i> ,	18.3
				<i>J</i> =5.4)	
7		202.7	28		23.1
8		45.4	29	0.82 (3H, <i>t</i> , <i>J</i> =6.5)	12.3
9		49.9	1'	4.39 (H, <i>d</i> , <i>J</i> =7.8)	101.5
10		38.5	2'		73.5
11		21.5	3'		77.3
12		38.7	4'		70.0
13		43.1	5'		73.5
14		49.9	6'	$4.26 (H_a, d,$	63.2
				<i>J</i> =11.5)	
				$4.44 (H_b, dd, J=*)$	
15		23.1	1''		174.0
16		28.6	2''	2.37 (H, t, J=6.5)	34.0
17		54.7	3''		25.0
18	0.66 (3H, <i>s</i> )	12.0	4''-	1.19-1.35	29.3-29.8
			13''		
19	1.18 (3H, s)	17.3	14''-		32.0
20		36.2	15''		22.7
21	0.91 (3H, <i>d</i> ,	19.0	16''	0.88 (3H, <i>t</i> , <i>J</i> =6.4)	14.1
	<i>I</i> =5 9)				

**Table S5:** <sup>1</sup>H-NMR and APT spectral data of **11** (7-oxo- $\beta$ -sitosterol-3-O- $\beta$ -D-glucopyranoside)-6'-palmitate).

The chemical shift ( $\delta$ ) is expressed in ppm and coupling constants (*J*) in Hz \* *J* value couldn't be calculated.

#	<sup>1</sup> H-NMR	APT	#	<sup>1</sup> H-NMR	APT
	(400 MHz, CDCl <sub>3</sub> )	(100 MHz,		(400 MHz, CDCl <sub>3</sub> )	(100 MHz,
		CDCl <sub>3</sub> )			CDCl <sub>3</sub> )
1		34.7	15		20.7
2		30.1	16		28.7
3	3.94 (H, <i>m</i> )	66.5	17		56.2
4		36.9	18	0.7886	12.9
				(9H,18,19,21)	
5		81.9	19	0.7886	18.2
				(9H,18,19,21)	
6	6.48 (H, <i>d</i> , <i>J</i> = 8.2)	135.4	20		39.4
7	6.22 (H, <i>d</i> , <i>J</i> = 8.2)	130.8	22	5.11 (H, <i>dd</i> , <i>J</i> =15.6,	132.3
				8.2)	
8		79.5	23		42.9
9		51.1	24		33.1
10		36.9	25	0.88 (3H, <i>d</i> , <i>J</i> =7.2)	19.7
11		23.4	26	0.97 (3H, d, J= 6.4)	20.0
12		39.4	27	1.07 (3H, d, J=5.9)	17.6
13		44.6	28	5.19(H, <i>dd</i> , <i>J</i> =15.1,	135.2
				7.3)	
14		51.7			

Table S6: <sup>1</sup>H-NMR and APT spectral data of 12 (5α, 8α-epi-dioxyergosta-6, 22-dien-3β-ol).

#	<sup>1</sup> H-NMR	APT	#	<sup>1</sup> H-NMR	APT
	(400 MHz, CDCl <sub>3</sub> )	(100 MHz,		(400 MHz,	(100 MHz,
		CDCl <sub>3</sub> )		CDCl <sub>3</sub> )	CDCl <sub>3</sub> )
1		38.4	16		23.4
2		27.0	17		46.4
3	3.13 (H, <i>dd</i> ., <i>J</i> = 5.04,	77.4	18	2.74 (H, <i>m</i> )	41.2
	11.44 )				
4		38.7	19		46.0
5		55.2	20		30.7
6		18.3	21		33.9
7		32.7	22		32.5
8		39.2	23	1.06 (3H, <i>s</i> )	28.1
9		47.0	24	0.70 (3H, <i>s</i> )	15.6
10		37.0	25	0.85 (3H, <i>s</i> )	15.3
11		23.0	26	0.70 (3H, <i>s</i> )	16.9
12	5.19 (H, br. <i>s</i> )	122.3	27	1.18 (3H, <i>s</i> )	25.9
13		143.8	28		180.7
14		41.7	29	0.91 (3H, <i>s</i> )	23.1
15		27.7	30	0.83 (3H, <i>s</i> )	23.6

Table S7:	<sup>1</sup> H-NMR	and APT	spectral data	a of <b>13</b>	(oleanolic acid)
-----------	--------------------	---------	---------------	----------------	------------------

 $\ensuremath{\textcircled{O}}$  2022 ACG Publications. All rights reserved.

#	<sup>1</sup> H-NMR	<sup>13</sup> C-NMR	HSQC	HMBC correlations
	(500 MHz,	(125 MHz,		
	DMSO- $d_6$ )	DMSO- $d_6$ )		
1		175.0	C-1	
2	2,13 (2H, <i>t</i> )	34.1	C-2	C-1, C-3, C-4
3	1.43, <i>m</i>	25.0	C-3	C-1, C-2, C-4
4	1.19, br.	29.5	C-4	
5,6	1.19, br.	25.4	C-5,C-6	
7	1.34, <i>m</i>	25.7	C-7	C-9
8	1.34, <i>m</i>	37.9	C-8	
9	3.9	71.0	C-9	C-8, C-10, C-11
10	5.51, <i>d</i>	135.0	C-10	C-9, C-11, C-12
11	5.51, <i>d</i>	129.9	C-11	C-9, C-10, C-12
12	3.78	74.7	C-12	C-10, C-11, C-13, C-14
13	3.25	74.2	C-13	C-11, C-12, C-15
14	1.34, <i>m</i>	32.3	C-14	
15	1.19, br.	29.6	C-15	
16	1.19, br.	32.0	C-16	
17	1.19, br.	22.6	C-17	
18	0.82 (2H, <i>t</i> )	14.5	C-18	C-16, C-17

**Table S8:** <sup>1</sup>H-, <sup>13</sup>C-NMR, HSQC, and HMBC spectral data of **14** (9, 12, 13-trihydroxy-10-octadecenoic acid).

#### S1: MTT Assay

Human cancer cell lines from liver (HePG-2), larynx (Hep-2), colon (HCT-116), or breast (MCF-7) originated from ATCC (Manassas, VA, USA) and were obtained from VACSERA, Cairo, Egypt. Cells were observed under an inverted microscope (Olympus 1x 70, Tokyo, Japan). MTT (3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide), dimethylsulfoxide (DMSO), 5-fluorouracil (5-FU), and RPMI-1640 medium were obtained from Sigma-Aldrich (St. Louis, MO, USA), 10% fetal bovine serum from GIBCO, Paisely, UK). The assay was carried out according to Mauceri et. al., 1998 [3]. The cell lines were cultured in RPMI-1640 medium with 10% fetal bovine serum. The antibiotics added are 100 units/mL penicillin and 100 µg/mL streptomycin at 37°C in a 5% CO<sub>2</sub> incubator. The samples were dissolved in DMSO and diluted with phosphate buffer solution (PBS) 5-fluorouracil was used as a standard anticancer drug for comparison. The cells (HePG2, HeP2, HCT116 and MCF-7) were seeded in a 96-well plate at a density of 1.0 x 104 cells/ well at 37°C for 24 hr under 5% CO<sub>2</sub>. Samples of different concentration were added to each well and cultured for 48 hr. The treated cells were washed with PBS and 100 µl of MTT solution (5mg/ml MTT stock in PBS diluted to 1 mg/ml with 10% RPMI-1640 medium) was added to each well and incubated for 4hr at 37°C. Finally, 100 µL of DMSO was added and optical densities at 570 nm were measured using a A BioTeck<sup>®</sup> microplate reader (Winooski, VT, USA). The relative cell viability in percentage was calculated as (A570 nm of treated samples/A570nm of untreated sample) X 100. Statistical analysis of the data was performed using Microsoft Excel software version 2010.

![](_page_50_Figure_0.jpeg)

Figure S40. Calculated  $IC_{50}$  ( $\mu$ M) for the *in vitro* cytotoxicity of 1-14

![](_page_50_Figure_2.jpeg)

Figure S41: The log concentration- cell viability graph of 5FU and 6 (syringaresinol).

#### References

- [1] Z. Güvenalp and L. Ö. Demirezer (2005). Flavonol glycosides from *Asperula arvensis* L., *Turk. J. Chem.* **29**, 163-169.
- [2] M. Wen-Li, D. Hao-Fu and W. Da-Gang (2006). A new norneolignan from *Cephalomappa sinensis, Chem. J. Chinese U.* 27, 1480-1481.
- [3] H. J. Mauceri, N. N. Hanna, M. A.Beckett, D. H. Gorski, M. J. Staba, K. A. Stellato, K. Bigelow, R. Heimann, S. Gately and M. Dhanabal, G. A. Soff, V. P. Sukhatme, D. W. Kufe and R. R. Weichselbaum (1998). Combined effects of angiostatin and ionizing radiation in antitumour therapy. *Nature* **394**, 287-291.