Polyprenylated Phloroglucinol Derivatives from *Hypericum sampsonii*

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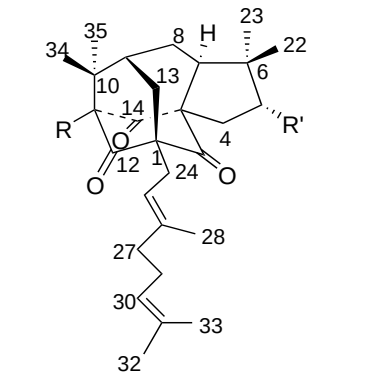
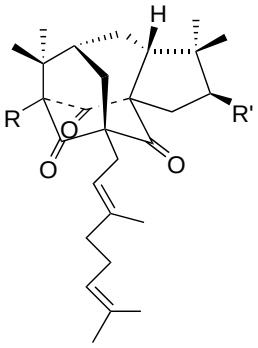
Six new prenylated phloroglucinol derivatives, hypersampsones A–F (**1**–**6**), were isolated from the aerial part of *Hypericum sampsonii,* together with 2,4,6-trihydroxybenzophenone, 2,4,6-trihydroxybenzophenone 4-*O*-geranyl ether, 2,4,6-trihydroxybenzophenone 3-*C*-geranyl ether, sampsoniones D and H. Their structures were elucidated by spectroscopic methods, mainly 1D- and 2D-NMR spectroscopy and mass spectrometry.

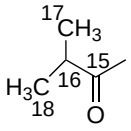
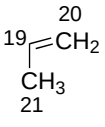
1. Introduction. – Diverse phloroglucinol derivatives have been isolated from *Hypericum* species [1–5]. The phloroglucinol derivatives have attracted our interest not only due to their structural diversity but also due to their biological activity [6–9]. *Hypericum sampsonii* (Guttiferae) has been used to decrease blood stasis, relieve swelling, and as a detoxifying agent, especially as one of the antihepatitis and anti-hepatoma herbs in Taiwan [10]. Xanthones and polyprenylated benzophenone derivatives have been isolated from this plant [11–15]. In the course of our search for biologically active components from *Hypericum* species in the folk herbal medicines of Taiwan, chemical re-investigation of this plant was conducted under a hepatitis B virus (HBV)-producing cell line (MS-G2) *in vitro* culture system-guided screening. Herein, we report the isolation and structure determination of six new polyprenylated phloroglucinol derivatives, hypersampsones A–F (**1**–**6**) from the anti-HBV e antigen (HBeAg)-active fraction.

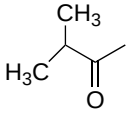
2. Results and Discussion. – The ethanolic extract of the dried whole plants was successively partitioned with AcOEt and BuOH. The anti-HBeAg-active (AcOEt-soluble) fraction was chromatographed on silica gel and *Cosmosil 75C18-PREP* columns in combination with semi-preparative HPLC analysis to give six new prenylated phloroglucinols, hypersampsones A (**1**), B (**2**), C (**3**), D (**4**), E (**5**), and F (**6**), together with five known prenylated benzophenones, 2,4,6-trihydroxybenzophenone [16], 2,4,6-trihydroxybenzophenone 4-*O*-geranyl ether [17], and 2,4,6-trihydroxybenzophenone 3-*C*-geranyl ether [17], sampsonione D and H [12].

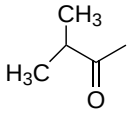
Compound **1**, named hypersamsone A, was obtained as a colorless oil, $[\alpha]_D^{25} = +21$ ($c = 0.25$, $CHCl_3$). The molecular formula was established as $C_{35}H_{50}O_4$ from HR-EI-MS at m/z 534.3688 and ^{13}C-NMR spectral data, with eleven indices of hydrogen deficiency (IHD). Analysis of NMR data revealed the structure of hypersamsone A (**1**) to be an analogue of sampsoniones, a adamantane derivative isolated from the same plant by *Hu* and *Sim* [11–14]. The IR spectrum showed C=O (1726, 1697, and 1686 cm^{-1}) and olefinic (3052, 1505, and 1496 cm^{-1}) absorptions. The ^{13}C-NMR and DEPT spectra (*Table*) revealed signals due to four nonconjugated C=O groups (δ(C) 203.4, 204.7,

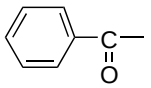


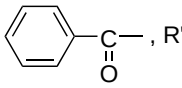


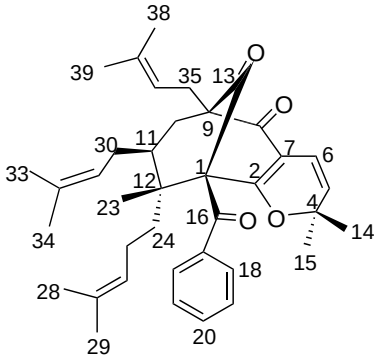
1 R=  , R'= 

2 R=  , R'= 

3 R=  , R'=H

4 R=  , R'= 

5 R=  , R'= 



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205.8, and 208.2), seven CH_2, six CH, ten Me groups, and eight additional quaternary C-atoms. The ^{1}H- NMR spectrum indicated the presence of an isobutanoyl (δ 2.01 (*m*, 1 H), 1.12 and 1.15 (*d*, $J = 7.0$, 3 H each), a geranyl side chain ((2.46 (*m*, 2 H), 5.15 and 5.06 (*t*, $J = 7.0$, 1 H each), 1.78 (*m*), 2.00 (*m*, 2 H each), 1.56, 1.66, and 1.67 (*s*, 3 H each)), and an isopropenyl (δ 4.89 and 4.95 (br. *s*, 1 H each) and 1.80 (*s*, 3 H)). Their connectivities to the basic skeleton at C(11), C(1), and C(5)[1]), were determined from

[1]) Arbitrary numbering according to the formula of **1**–**6**. For systematic names, see *Exper. Part*.

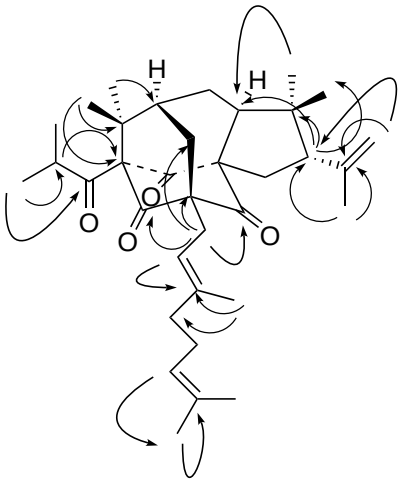


Fig. 1. *Key HMBC correlations of* **1**

the HMBC correlations (*Fig. 1*) between geminal Me groups of isobutanoyl and C(16) (δ 43.1), C(15)=O (δ 208.2), between H−C(16) (δ 2.01, (*m*)) and C(11) (δ 86.0), C(15), C(17), and C(18), between geminal Me groups at C(10) (δ 1.30 and 1.32 (*s*, 3 H)) and C(11), C(9) (δ 43.8), between CH_2(24) H-atoms (δ 2.46 (*d*, *J* = 7.0, 2 H)) and quaternary C(1)-atom (δ 74.2), C(12)=O (δ 203.4) and C(2) (δ 205.8), and C(13) (δ 28.9), and between geminal Me groups at C(6) (δ 0.89 and 0.91 (*s*, 3 H each)) and C(5) (δ 54.8), C(6) (δ 44.3), and C(7) (δ 57.3), between Me group at C(19) and C(5), and the 1D-TOCSY experiment showed the proton sequence: H−C(13) (δ 2.00 (*m*))/H−C(9) (δ 2.00 (*m*))/H−C(8) (δ 1.72 (*m*), 2.44 (*m*))/H−C(7) (1.98 (*m*)) leading to the confirmation of a tetracyclo[7.3.1.$1^{3,11}$.$0^{3,7}$]tetradecane-2,12,14-trione skeleton. The NOE correlations observed between CH_2(24) H-atoms and Me(28) H-atoms (δ 1.66 (*s*, 3 H)), and the H−C(25) (δ 5.15 (*t*, *J* = 7.0)) and CH_2(27) H-atoms (δ 1.78 (*m*, 2 H)) allowed us to assign the (*E*)-configuration of the C(25)=C(26) bond in the geranyl moiety at C(1). The relative configurations at the stereogenic centers C(11), C(1), C(3), and C(9) were derived from the adamantyl skeleton and 2D NOESY experiment, and the correlations (*Fig. 2*) of the ^{1}H signals of H−C(5) (δ 3.08 (*dd*, *J* = 12.0, 7.0)) with H−C(22) (δ 0.89 (*s*, 3 H)), one of the C(13)H_2 H-atoms (δ 2.00 (*m*)), with H−C(22), and the H−C(7) (δ 1.98 (*m*)) with H−C(35) (δ 1.32 (*s*, 3 H)) and H−C(23) (δ 0.91 (*s*)) provided the relative configurations at C(5) and C(7). A comparison of the ^{1}H- and ^{13}C-NMR spectra of **1**, and those of sampsonione D [12][14] revealed that the only difference was the benzoyl in sampsonione D replaced by an isobutanoyl in **1**.

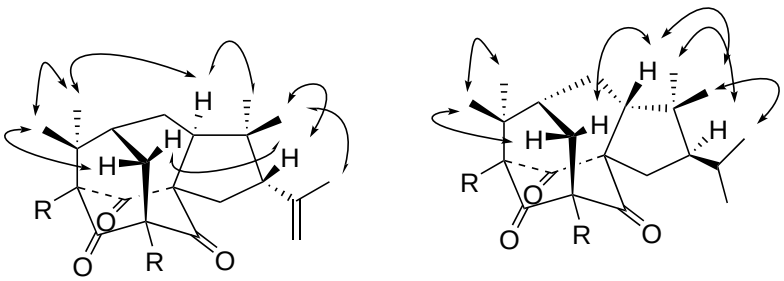
Hypersampsone B (**2**) was isolated as a colorless oil, $[\alpha]_D^{25} = +12$ (*c* = 0.25, $CHCl_3$) with a molecular formula of $C_{35}H_{52}O_4$ obtained from HR-EI-MS and ^{13}C-NMR spectra. The ^{1}H- and ^{13}C-NMR spectra (*Table*) were similar to those of **1** except the isopropenyl group in **1** was replaced by an i-Pr group (δ 1.56 (*m*, 1 H), 0.92 and 0.94 (*d*, *J* = 7.0, 3 H each)) in **2**. But, in the NOE correlations in a NOESY spectrum, a cross-peak was present between the ^{1}H signal of CH_2(13) (δ 1.95 (*m*)) and the H−C(34) (δ 1.18 (*s*)) and the H−C(7) (δ 2.00 (*m*)); and between H−C(23) (δ 0.92 (*s*)) and H−C(5) (δ 1.91

Table. *NMR Data for Hypersampsones A* (**1**), *B* (**2**), *C* (**3**), *D* (**4**), *E* (**5**), *and F* (**6**) (in $CDCl_3$ with 500-MHz (^1H) and 125-MHz (^{13}C) NMR, δ in ppm)

Atoms	**1**		**2**		**3**		**4**		**5**	
	^1H	^{13}C	^1H	^{13}C	^1H	^{13}C	^1H	^{13}C	^1H	^{13}C
C(1)		74.2		72.5		75.2		73.7		72.6
C(2)		205.8		204.7		204.8		206.5		205.0
C(3)		68.6		67.5		67.4		69.2		68.0
CH_2(4)	2.00 (*m*), 2.68 (*t*, *J* = 12.0)	34.1	1.81 (*m*), 2.34 (*t*, *J* = 12.0)	33.6	2.00 (*m*), 2.37 (*m*)	35.0	2.14 (*m*), 2.25 (*m*)	35.9	2.51 (*m*)	34.3
H–C(5)	3.08 (*dd*, *J* = 12.0, 7.0)	54.8	1.91 (*m*)	56.6	1.54 (*m*), 1.74 (*m*)	42.7	1.96 (*m*)	55.2	2.06 (*m*)	56.1
C(6)		44.3		44.8		44.5		44.2		44.9
H–C(7)	1.98 (*m*)	57.3	2.00 (*m*)	56.9	1.75 (*m*)	56.0	2.05 (*m*)	58.1	2.04 (*m*)	56.4
CH_2(8)	1.72 (*m*), 2.44(*m*)	28.9	1.98 (*m*)	26.1	2.00 (*m*)	28.6	2.00 (*m*)	29.2	2.02 (*m*)	27.0
H–C(9)	2.00 (*m*)	43.8	1.84 (*m*)	43.1	1.93 (*m*)	43.2	2.07 (*m*)	44.0	2.08 (*m*)	42.8
C(10)		49.9		46.5		47.1		51.0		47.6
C(11)		86.0		86.3		85.6		81.2		82.1
C(12)		203.4		203.6		202.7		204.4		204.2
CH_2(13)	2.00 (*m*)	28.9	1.95 (*m*)	26.0	2.00 (*m*)	23.7	2.02 (*m*)	26.8	2.01 (*m*)	26.2
C(14)		204.7		204.8		203.0		205.2		204.9
C(15)		208.2		208.1		207.8		192.9		193.3
C(16)	2.01 (*m*)	43.1	1.92 (*m*)	42.4	1.91 (*m*)	42.4				
Me(17)	1.15 (*d*, *J* = 7.0)	21.2	0.97 (*d*, *J* = 7.5)	22.6	1.00 (*d*, *J* = 7.0)	20.5				
Me(18)	1.12 (*d*, *J* = 7.0)	21.6	0.95 (*d*, *J* = 7.5)	20.5	1.03 (*d*, *J* = 7.0)	21.0				
H–C(19)		145.4	1.56 (*m*)	29.0			2.25 (*m*)	29.8	2.63 (*m*)	29.3
H–C(20)	4.89 (br. *s*), 4.95 (br. *s*)	111.9	0.94 (*d*, *J* = 7.0)	29.3			1.03 (*d*, *J* = 6.5)	23.7	0.96 (*d*, *J* = 6.5)	23.7
H–C(21)	1.80 (*s*)	24.0	0.92 (*d*, *J* = 7.0)	21.0			0.94 (*d*, *J* = 6.5)	22.1	0.91 (*d*, *J* = 6.5)	22.4
Me(22)	0.89 (*s*)	29.3	0.91 (*s*)	27.3	0.99 (*s*)	28.4	1.02 (*s*)	28.1	0.99 (*s*)	27.4
Me(23)	0.91 (*s*)	27.1	0.92 (*s*)	23.2	1.01 (*s*)	20.9	0.88 (*s*)	26.2	1.00 (*s*)	26.8
CH_2(24)	2.46 (*d*, *J* = 7.0)	29.3	2.47 (*d*, *J* = 7.0)	29.1	2.56 (*m*)	29.1	2.58 (*m*)	29.8	2.08 (*m*)	29.2
H–C(25)	5.15 (*t*, *J* = 7.0)	119.3	5.17 (*t*, *J* = 7.0)	119.3	5.27 (*t*, *J* = 7.0)	119.2	5.07 (*t*, *J* = 7.0)	119.4	5.07 (*t*, *J* = 6.5)	119.2
C(26)		138.3		139.1		139.1		138.5		139.1
CH_2(27)	1.78 (*m*)	41.8	1.99 (*m*)	40.3	2.02 (*m*)	40.3	1.88 (*d*, *J* = 12.5), 2.03 (*m*)	42.9	2.05 (*m*)	40.2
Me(28)	1.66 (*s*)	25.7	1.54 (*s*)	25.0	1.70 (*s*)	26.0	1.59 (*s*)	17.9	1.60 (*s*)	17.9
CH_2(29)	2.00 (*m*)	40.0	2.00 (*m*)	34.8	2.02 (*m*)	40.3	1.97 (*m*)	40.2	2.12 (*m*), 2.45 (*m*)	35.3
H–C(30)	5.06 (*t*, *J* = 7.0)	124.2	5.00 (*t*, *J* = 7.0)	124.4	5.07 (*t*, *J* = 7.0)	124.4	5.12 (*t*, *J* = 7.0)	124.4	5.28 (*t*, *J* = 7.2)	119.2
C(31)		131.4		131.6		131.7		131.6		131.7
Me(32)	1.56 (*s*)	17.7	1.52 (*s*)	17.9	1.60 (*s*)	17.9	1.62 (*s*)	26.0	1.57 (*s*)	26.0
Me(33)	1.67 (*s*)	16.4	1.56 (*s*)	16.5	1.67 (*s*)	16.5	1.67 (*s*)	16.6	1.67 (*s*)	16.6
Me(34)	1.30 (*s*)	25.2	1.18 (*s*)	26.0	1.27 (*s*)	25.2	1.40 (*s*)	25.5	1.40 (*s*)	25.4
Me(35)	1.32 (*s*)	22.6	1.19 (*s*)	22.6	1.27 (*s*)	22.6	1.45 (*s*)	23.0	1.41 (*s*)	22.8
Ph							7.09 (*d*, *J* = 7.2), 7.25 (*dd*, *J* = 7.2, 8.5), 7.39 (*t*, *J* = 8.5)	128.3, 128.3, 129.2, 129.2, 132.3, 135.2	7.08 (*d*, *J* = 7.5), 7.30 (*dd*, *J* = 7.5, 8.0), 7.40 (*t*, *J* = 8.0)	128.5, 128.5, 128.7, 128.7, 132.5, 135.2

(*m*)) (*Fig. 2*), indicating reversed relative configurations at C(5), C(7), and C(9) with respect to **1**.

Hypersampsone C (**3**) gave a *quasi*-molecular ion peak at *m*/*z* 494.34121, indicating a molecular formula of $C_{32}H_{46}O_4$. ^1H- and ^{13}C-NMR Spectral data of **3** showed that



1 **2**

Fig. 2. *Key NOE correlations for hypersampsones A* (**1**) *and B* (**2**)

compound **3** has the same main skeleton as **2**. The only difference is the i-Pr side chain at C(5) in **2** is absent in **3**. The NOE cross-peaks between the H–C(7) and the CH_2(13) H-atom, between the Me(34) H-atom and the CH_2(13) H-atom, and between the Me(23) H-atom and CH_2(5) H-atom established the β-configuration of H–C(7) as in **2**.

The HR-EI-MS of **4** indicated a molecular formula of $C_{38}H_{50}O_4$. The ^{1}H- and ^{13}C-NMR spectral data (*Table*) of **4** were similar to those of **2** except for the isobutanoyl group in **2** replaced by a benzoyl group in **4**. The NOESY spectrum showed the correlations of the ^{1}H signal at δ 2.02 (H–C(13)) with the Me groups at δ 0.99 (H–C(22)) and 1.40 (H–C(34)), indicating that the H–C(7) was α-oriented.

Compound **5** was assigned the same molecular formula as **4** on the basis of HR-EI-MS. The NMR data (*Table*) were similar to those of **4**. Compared to those of **4**, the ^{1}H-NMR data of **5** displayed the same pattern but different chemical shifts of two vinyl H-atoms of the geranyl and two Me groups of the i-Pr group. The NOE correlations at δ 2.01 (H–C(13)) with the Me groups at δ 1.40 (H–C(34)) and 2.04 (H–C(7)) led to the assignment of β-orientation of H–C(7).

Hypersampsone F (**6**) was obtained as a colorless oil, $[\alpha]_D^{25} = +30$ ($c = 0.2$, $CHCl_3$). Evidence from C=O (1724 and 1702), conjugated C=O (1647 cm^{-1}) absorptions in IR spectrum, and aromatic moiety and conjugated system (247, 283 (sh.), and 320 nm) in UV spectrum, and the NMR data indicated that compound **6** was an hyperforin derivative [18][19]. A molecular formula of $C_{38}H_{48}O_4$ was found by HR-EI-MS, and NMR spectral data with 15 IHD. A base peak at *m/z* 105 in the mass spectrum indicated an unsubstituted phenyl ketone. ^{1}H- and ^{13}C-NMR spectra indicated that **6** is a trioxygenated benzophenone derivative incorporating five isoprene units, in which one of the isoprene moieties formed a 2,2-dimethylpyrano ring (δ 6.42 and 5.21 (*d*, $J = 10.2$, 1 H each), 1.39 and 0.52 (*s*, 3 H)). The IR spectrum showed no free OH absorption, and the ^{13}C-NMR spectrum displayed an α-substituted enolyzed β-dicarbonyl system (δ 168.1 (C(2)), 112.4 (C(7)), 191.8 (C(8)), indicating that the keto-enol of the β-dicarbonyl system was covalently fused with the pyran ring. From the above evidence, **6** was established as a pyranobenzohyperforin derivative. The HMBC spectrum showed long-range H-to-C connectivities (*Fig. 3*) from H–C(6) (δ 6.42) to C(8) (δ 191.8), C(7) (δ 112.4), C(2) (δ 168.1), C(5) (δ 124.0), and C(4) (δ 83.4), from H–C(10) (δ 2.50 and

2.52 (*m*, 1 H each)) to C(13) (*δ* 207.4), C(9) (*δ* 63.8), and C(8), and from H–C(35) (*δ* 2.51 (*d*, *J* = 7.0, 2 H)) to C(13), C(10) (*δ* 40.6), C(9), and C(8), from H–C(14) (*δ* 0.52) to C(5) and C(4), and C(15), and from H–C(15) (*δ* 1.39) to C(5), C(4), and C(14), indicating that the pyran ring was formed between C(4) and C(2). The Me(14) H-atom of **6**, observed at higher field (*δ* 0.52) indicated that the Me group must be shielded by the anisotropic effect of the benzene ring. From the evidence above, compound **6** was established as pyrano[10, 12-*b*]benzoylhyperforin.

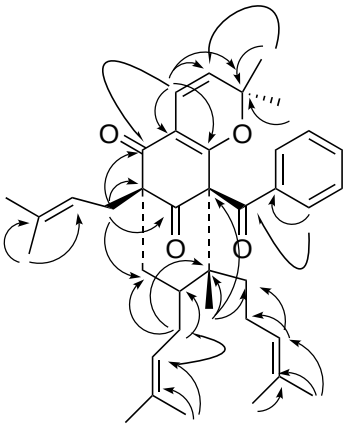


Fig. 3. *Key HMBC correlations of* **6**

Compounds **1**–**6** were tested for anti-HBeAg activity. All of these compounds showed mild anti-HBeAg secretion at 10 μg/ml on MS-G2 hepatoma cell line, but no inhibition of viral particle replication.

Experimental Part

General. Column chromatography (CC): *Cosmosil 75C18-PREP (Nacalai Tesque)* and silica gel (70–230 mesh; *Merck*). TLC: Silica gel *60F*$_{254}$ (*Merck*) with 7% AcOEt/hexane as eluent. HPLC: Silica gel pre-packed column (*Cosmosil* 7 μm, 10 × 254 mm) for prep. analysis. M.p.: *Yanagimoto* micro-melting-point apparatus; uncorrected. UV Spectra: *Hitachi U-3200* spectrophotometer. IR Spectra: *Nicolet Avatar 320 FT-IR* spectrophotometer. Optical rotations: *JASCO DIP-370* polarimeter. NMR Spectra: *Varian Unity INOVA-500* spectrometer. Mass spectra (EI-MS and HR-EI-MS): *JEOL JMS-HX110* and a *Finnigan MAT 95S* mass spectrometer, respectively.

Plant Material. The aerial parts of *H. sampsonii* was collected from Chia-Yi county, Taiwan, in June, 2000. The plant was identified by Mr. *Jun-Chih Ou*, a research fellow of the National Research Institute of Chinese Medicine, and by comparison with the voucher specimens already deposited at the Herbarium of the Department of Botany, National Taiwan Unversity, Taipei, Taiwan (No. 077152).

Extraction and Isolation. The aerial parts of *H. sampsonii* (12 kg) were extracted with EtOH (3 × 10 oml) at 60° (overnight). The EtOH extracts were combined and evaporated under reduced pressure to give 452 g of residue. The concentrate was taken up in H_2O, and partitioned with AcOEt (3 × 1 l) and BuOH successively. The anti-HBV-active, AcOEt-soluble fraction (118 g) was subjected to CC (silica gel; hexane/AcOEt/MeOH). The fractions (5–10% AcOEt) rich in benzophenones were rechromatographed over *Cosmosil 75C18-PREP* column with 90% MeOH/H_2O and MeOH. Fractions eluated from MeOH were separated by silica-gel (7 μm) prep. HPLC to yield hypersampsones A (45 mg), B (29 mg), C (26 mg), D (125 mg), E (75 mg), and F (58 mg).

1-(3,7-Dimethylocta-2,6-dienyl)-6,6,10,10-tetramethyl-5-(1-methylethenyl)-11-(2-methylpropanoyl)tetracyclo[7.3.1.1^{3,11}.0^{3,7}]tetradecane-2,12,14-trione (= *Hypersampsone A*; **1**). Colorless oil. $[\alpha]_D^{25} = +21$ ($c = 0.25$, $CHCl_3$). IR (film): 3052, 1726, 1697, 1686, 1505, 1496, 1384, 1372, 1230, 889. ^{1}H- and ^{13}C-NMR: *Table.* HMBC correlations: *Fig. 1.* Key NOE correlations: *Fig. 2.* EI-MS: 534 (15, M^+), 70 (85, C_3H_6CO), 61 (100). HR-EI-MS: 534.3688 ($C_{35}H_{50}O_4^+$; calc. 534.3704).

1-(3,7-Dimethylocta-2,6-dienyl)-6,6,10,10-tetramethyl-5-(1-methylethyl)-11-(2-methylpropanoyl)tetracyclo[7.3.1.1^{3,11}.0^{3,7}]tetradecane-2,12,14-trione (= *Hypersampsone B*; **2**). Colorless oil. $[\alpha] = +12$ ($c = 0.25$, $CHCl_3$). IR (film): 1726, 1695, 1680, 1385, 1372, 1234. ^{1}H- and ^{13}C-NMR: *Table.* Key HMBC correlations: *Fig. 1.* Key NOE correlations: *Fig. 2.* EI-MS: 536 (60, M^+), 467 (100, $[M^+ - C_3H_7CO - 2\,H]^+$). HR-EI-MS: 536.3851 ($C_{35}H_{52}O_4^+$; calc. 536.3860).

1-(3,7-Dimethylocta-2,6-dienyl)-6,6,10,10-tetramethyl-11-(2-methylpropanoyl)tetracyclo[7.3.1.1^{3,11}.0^{3,7}]tetradecane-2,12,14-trione (= *Hypersampsone C*; **3**). Colorless oil. $[\alpha]_D^{25} + 14.3$ ($c = 0.21$, $CHCl_3$). IR (film): 3060, 1735, 1693, 1678, 1598, 1389, 1378, 1220, 757, 683. ^{1}H- and ^{13}C-NMR: *Table.* EI-MS: 494 (60, M^+), 467 (100, $[M - C_3H_7CO - 2\,H]^+$). HR-EI-MS: 494.3412 ($C_{35}H_{52}O_4^+$; calc. 494.3398).

11-Benzoyl-1-(3,7-dimethylocta-2,6-dienyl)-6,6,10,10-tetramethyl)-5-(1-methylethyl)tetracyclo[7.3.1.1^{3,11}.0^{3,7}]-tetradecane-2,12,14-trione (= *Hypersampsone D*; **4**). Colorless oil. $[\alpha]_D^{25} = -35$ ($c = 0.20$, $CHCl_3$). UV (MeOH): 270 (sh, 3.16), 244 (3.95), 222 (4.35). IR (film): 3090, 1733, 1696, 1692, 1684, 1593, 1584, 1446, 1384, 1372, 1222, 1173, 750. ^{1}H- and ^{13}C-NMR: *Table.* EI-MS: 570 (8, M^+), 105 (100, C_6H_5CO). HR-EI-MS: 570.3715 ($C_{38}H_{50}O_4^+$; calc. 570.3711).

Epimer of **4** (= *Hypersampsone D*; **5**). Colorless oil. $[\alpha]_D^{25} = +39$ ($c = 0.20$, $CHCl_3$). UV (MeOH): 272 (sh, 3.15), 245 (3.98), 221 (4.45). IR (film): 3070, 1736, 1703, 1688, 1590, 1581, 1390, 1380, 1236, 1172, 750. ^{1}H- and ^{13}C-NMR: *Table.* EI-MS: 570 (15, M^+), 105 (100, C_6H_5CO). HR-EI-MS: 568.3708 ($C_{38}H_{50}O_4^+$; calc. 568.3711).

1-Benzoyl-4,4,12-trimethyl-9,11-bis(3-methylbut-2-enyl)-12-(4-methylpent-3-enyl)-3-oxatricyclo[7.3.1.0^{2,7}]-trideca-2(7),5-diene-8,13-dione (= *Hypersampsone F*; **6**). Colorless oil. $[\alpha]_D^{25} = +30.0$ ($c = 0.20$, $CHCl_3$). UV (MeOH): 320 (3.52), 284 (sh, 3.64), 247 (4.01), 222 (4.45). IR (film): 3075, 1724, 1701, 1647, 1589, 1671, 1384, 1372, 1222, 1113, 757. ^{1}H-NMR ($CDCl_3$, 500 MHz): 0.52, 1.38, 1.39, 1.50, 1.53, 1.55, 1.62, 1.65, 1.68 (3*s*, each 3 H); 1.54 (*m*, H–C(11)); 1.97–2.01 (*m*, H–C(24)); 2.01–2.03 (*m*, H–C(25)); 2.11, 2.32 (2*m*, each 1 H, CH_2(30)); 2.50, 2.52 (2*m*, each 1 H, CH_2(35)); 4.85 (*t*, $J = 7.0$, H–C(26)); 5.05 (*t*, $J = 7.0$, H–C(31)); 5.10 (*t*, $J = 7.0$, H–C(36)); 5.21, 6.42 (2*d*, each 1 H, $J = 10.2$, H–C(5) and H–C(6)); 7.25 (*t*, $J = 8.0$, H–C(19), H–C(21)); 7.38 (*t*, $J = 8.0$, H–C(20)); 7.58 (*t*, $J = 8.0$, H–C(18), H–C(22)). ^{13}C-NMR ($CDCl_3$, 125 MHz): 16.5 (C(38)); 17.7 (C(39)); 17.9 (C(34)); 23.4 (C(29)); 25.7 (C(28)); 25.7 (C(33)); 27.2 (C(23)); 27.3 (C(25)); 28.3 (C(15)); 29.6 (C(30)); 29.8 (C(35)); 30.4 (C(14)); 40.0 (C(24)); 40.6 (C(10)); 48.5 (C(11)); 49.8 (C(12)); 63.8 (C(9)); 70.8 (C(1)); 83.4 (C(4)); 112.4 (C(7)); 114.7 (C(6)); 119.3 (C(36)); 124.0 (C(5)); 124.2 (C(26)); 128.0 (C(19)); 128.0 (C(21)); 128.4 (C(18)); 128.4 (C(22)); 132.1 (C(20)); 131.2 (C(27)); 132.7 (C(32)); 136.9 (C(17)); 138.1 (C(37)); 168.1 (C(2)); 191.8 (C(8)); 193.2 (C(16)); 207.4 (C(13)). HMBC Correlations: *Fig. 3.* EI-MS: 568 (10, M^+), 105 (100, C_6H_5CO). HR-EI-MS: 568.3527 ($C_{38}H_{48}O_4^+$; calc. 568.3547).

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