



DITERPENES AND RELATED CYCLOADDUCTS FROM *TAIWANIA CRYPTOMERIOIDES*

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Key Word Index—*Taiwania cryptomerioides*; Taxodiaceae; leaves; diterpenes.

Abstract—Seven new compounds were isolated from the leaves of *Taiwania cryptomerioides*. Taiwaniaquinone D and taiwaniaquinone E are diterpenes having a six-five-six fused ring skeleton. Taiwaniadduct A is a [4 + 2] cycloaddition product of β -myrcene and taiwaniaquinone A. Taiwaniadduct B and taiwaniadduct C are isomers derived from [4 + 2] cycloadditions of *trans*-ozic acid and taiwaniaquinone A. Taiwaniadduct D is formally an ene reaction product of taiwaniadduct B. Taiwaniadduct E is a [5 + 2] cycloaddition product of taiwaniaquinone A and *trans*-ozic acid. The structure determination of these new compounds was based on spectral analyses and chemical transformation. A crystalline compound, prepared by bismethylation of taiwaniadduct D, was analysed by X-ray diffraction to establish the stereochemistry.

INTRODUCTION

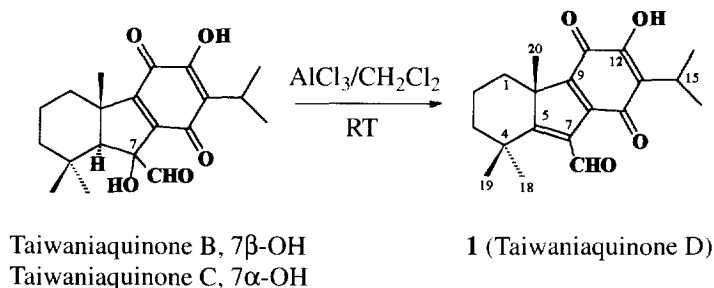
Taiwania cryptomerioides Hayata is an endemic ever-green species with thick linear-triangular leaves and elongate ovoid cones. The chemical constituents of this plant have been investigated extensively [1–3]. Various sesquiterpenes, lignans and bisflavones have been found in the leaves and wood. Four diterpenes (taiwaniaquinones A–C and taiwaniaquinol A) and one norditerpene (taiwaniaquinol B) having the unusual 6-5-6 fused ring skeleton were recently isolated [4]. We now report on a further two diterpenes, **1** and **2**, of this type and five related terpenes (**3**–**7**) derived from the combination of taiwaniaquinone A with a monoterpene, β -myrcene, or a diterpene, *trans*-ozic acid.

RESULTS AND DISCUSSION

The acetone extract of the leaves of *T. cryptomerioides* was concentrated and taken up in chloroform. The soluble part was concentrated and

subjected to chromatography to give compounds **1**–**7**.

Compound **1** gave rise to a molecular ion $[M]^+$ at m/z 328.168 consistent with a molecular formula $C_{20}H_{24}O_4$. The 1H and ^{13}C NMR spectra (Table 1) indicated an aldehyde group [δ_H 10.38 (s) and δ_C 194.1 (d)] and two ketone groups [δ_C 185.1 (s) and 177.2 (s)]. The carbonyl groups were conjugated with olefinic double bonds as inferred from the IR absorptions at 1691 and 1630 cm^{-1} as well as the presence of six olefinic carbon signals at δ_C 176.6 (s), 152.2 (s), 147.7 (s), 147.1 (s), 134.4 (s) and 123.2 (s). Proton resonances for three methyl groups occurred at δ 1.14 (s), 1.28 (s) and 1.44 (s), whereas those for an isopropyl group occurred at δ 1.18 (d), 1.19 (d) and 3.15 (sept). Compound **1** was given the trivial name taiwaniaquinone D, and its structure was finally elucidated by means of HMBC and HMQC. Treatment of taiwaniaquinone B (or taiwaniaquinone C) with $AlCl_3$ in CH_2Cl_2 yielded a dehydration product which was identified as taiwaniaquinone D (Scheme 1).



Scheme 1. Chemical synthesis of taiwaniaquinone D.

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Table 1. ^{13}C and ^1H NMR spectral data of compounds **1** and **2** (CDCl_3 , δ in ppm)

	1		2	
	δ_{C}	δ_{H}	δ_{C}	δ_{H}
1	35.2	2.40 (<i>br d</i> , 13.0)*†	34.3	2.22 (<i>br d</i> , 12.0), 1.58 (<i>m</i>)
2	18.3	1.68 (<i>m</i>), 1.94 (<i>m</i>)	19.2	1.75 (<i>m</i>), 1.62 (<i>m</i>)
3	43.3	1.72 (<i>m</i>), 1.26 (<i>m</i>)	41.2	1.45 (<i>m</i>), 1.22 (<i>m</i>)
4	38.0		33.7	
5	176.6		62.4	2.13 (<i>d</i> , 11.6)
6	194.1	10.38 (<i>s</i>)	174.2	
7	134.4		47.0	3.61 (<i>d</i> , 11.6)
8	147.1		148.5	
9	147.7		151.6	
10	55.9		48.0	
11	177.2		181.2	
12	152.2		151.1	
13	123.2		124.7	
14	185.1		185.2	
15	24.0	3.15 (<i>sept</i> , 7.1)	24.0	3.10 (<i>sept</i> , 7.0)
16	19.9	1.19 (<i>d</i> , 7.1)	19.8	1.14 (<i>d</i> , 7.0)
17	19.9	1.18 (<i>d</i> , 7.1)	19.7	1.17 (<i>d</i> , 7.0)
18	33.7	1.14 (<i>s</i>)	32.0	0.82 (<i>s</i>)
19	25.6	1.28 (<i>s</i>)	21.4	1.03 (<i>s</i>)
20	21.3	1.44 (<i>s</i>)	19.9	1.10 (<i>s</i>)
CO_2CH_3			52.3	3.73 (<i>s</i>)

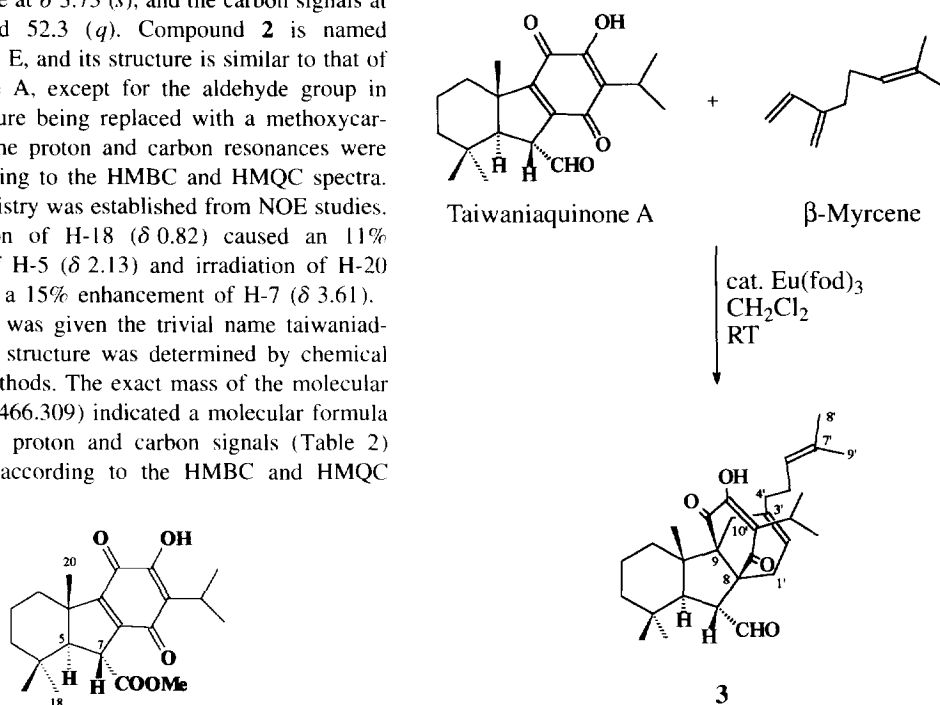
*The signal of the other proton was too weak to be assigned.

†Coupling constants (*J* in Hz) in parentheses.

Compound **2** ($\text{C}_{21}\text{H}_{28}\text{O}_5$) exhibited characteristic spectroscopic properties of a *p*-quinone moiety, i.e. UV absorption at 431 nm, IR absorption at 1635 cm^{-1} and NMR at δ 185.2 (*s*), 181.2 (*s*), 151.6 (*s*), 151.1 (*s*), 148.5 (*s*) and 124.7 (*s*). A methyl ester group was inferred from the IR absorption at 1735 cm^{-1} , the proton resonance at δ 3.73 (*s*), and the carbon signals at δ 174.2 (*s*) and 52.3 (*q*). Compound **2** is named taiwaniaquinone E, and its structure is similar to that of taiwaniaquinone A, except for the aldehyde group in the latter structure being replaced with a methoxycarbonyl group. The proton and carbon resonances were assigned according to the HMBC and HMQC spectra. The stereochemistry was established from NOE studies. Thus, irradiation of H-18 (δ 0.82) caused an 11% enhancement of H-5 (δ 2.13) and irradiation of H-20 (δ 1.10) caused a 15% enhancement of H-7 (δ 3.61).

Compound **3** was given the trivial name taiwaniaduct A, and its structure was determined by chemical and spectral methods. The exact mass of the molecular ion $[\text{M}]^+$ (m/z 466.309) indicated a molecular formula $\text{C}_{30}\text{H}_{42}\text{O}_4$. The proton and carbon signals (Table 2) were assigned according to the HMBC and HMQC

spectra. Triterpene **3** was presumably derived from the $[4+2]$ cycloaddition of the monoterpene, β -myrcene, and the diterpene, taiwaniaquinone A (Scheme 2). The stereochemistry was deduced from NOE studies. For example, irradiation of H-6 (δ 9.94) caused an 8%

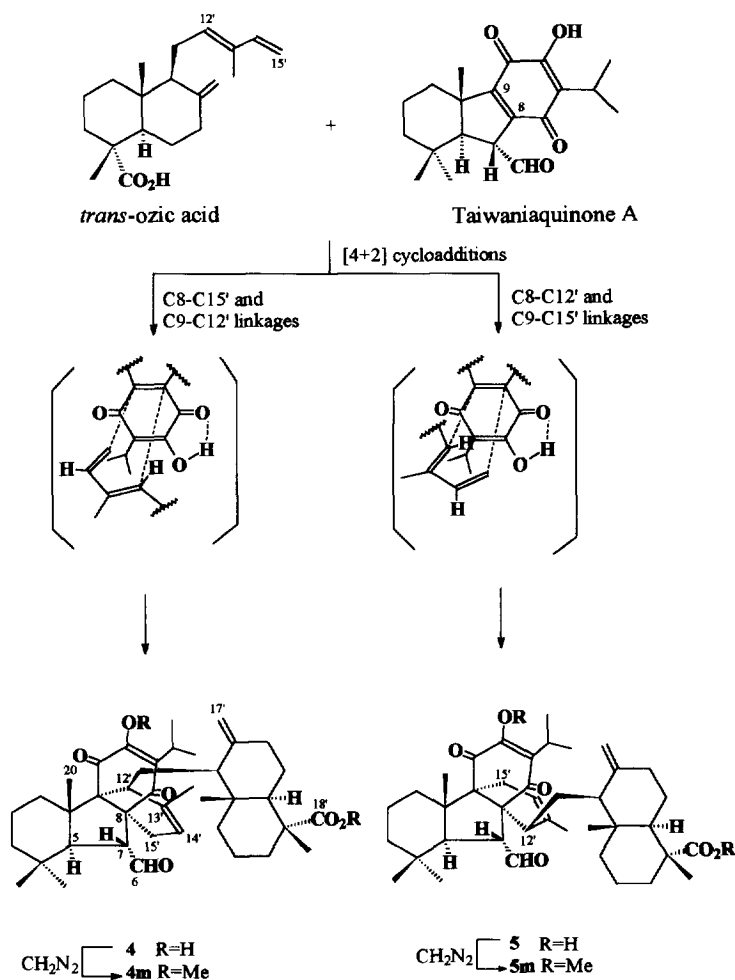
Scheme 2. Chemical synthesis of compound **3**.

enhancement of H-1' (δ 2.34), indicating that the monoterpene moiety and the aldehyde group were on the same face. The Diels–Alder reaction [5, 6] between taiwaniaquinone A and β -myrcene was promoted by a Lewis acid $\text{Eu}(\text{fod})_3$ to give a single product identical to **3**. The reaction occurred in a regio- and stereo-specific manner, i.e. β -myrcene attacked the less hindered α -face of taiwaniaquinone A to form C8–C1' and C9–C10' bonds. The 10-methyl group of taiwaniaquinone A presumably hindered a β -face approach by β -myrcene. The regio-isomer with C8–C10' and C9–C1' bonds was not formed, because it would exert severe repulsion between the 13-isopropyl and 3'-alkyl groups.

Terpenes **4** (taiwaniaduct B) and **5** (taiwaniaduct C) were not readily purified. Compounds **4m** and **5m** obtained by bismethylation of **4** and **5** (CH_2N_2 , Et_2O) were purified by HPLC and their structures were determined by spectroscopic methods (IR, MS, HRMS, and ^1H , ^{13}C , HMBC and HMQC NMR). Compounds **4m** and **5m** were isomers giving rise to molecular ions $[\text{M}]^+$ at 660.439 attributable to the molecular formula $\text{C}_{42}\text{H}_{60}\text{O}_6$. The ^1H and ^{13}C NMR spectra of **4m** showed the characteristic resonances (Table 2) of an

aldehyde group [δ_{H} 9.60 (*d*) and δ_{C} 205.4 (*d*)], a methyl ester [δ_{H} 3.56 (*s*), δ_{C} 51.8 (*q*) and 178.9 (*s*)], conjugated ketones [δ_{C} 198.6 (*s*) and 201.3 (*s*)], a methoxy group [δ_{H} 3.91 (*s*)], a terminal double bond [δ_{C} 108.7 (*t*) and 146.8 (*s*)], a trisubstituted double bond [δ_{C} 120.4 (*d*) and 144.2 (*s*)], as well as for a tetrasubstituted double bond [δ_{C} 141.3 (*s*) and 159.0 (*s*)]. The regio- and stereochemistry of **4m** was supported by the NOESY spectrum. H-5 (δ 1.57) had NOE correlations with H-6 (δ 9.60) and H-12' (δ 3.10), whereas H-7 (δ 3.10) had a correlation to H-20 (δ 0.63), whereas the NOESY spectrum of **5m** showed the correlations of H-6 (δ 9.50) to H-12' (δ 2.20), H-5 (δ 1.79) to H-14' (δ 5.55) and H-7 (δ 3.14) to H-20 (δ 0.73).

Compounds **4** and **5** were presumably derived from [4 + 2] cycloadditions of the labdane diterpene, *trans*-ozic acid, and taiwaniaquinone A (Scheme 3). Compound **4** had the linkages at C8–C15' and C9–C12', whereas compound **5** had the alternative linkages at C8–C12' and C9–C15'. The stereochemistry shown in **4** and **5** is consistent with cycloadditions of two components occurring at the less hindered faces and following the endo-selectivity of conventional Diels–Alder reactions.



Scheme 3. Formation of compounds **4** and **5**.

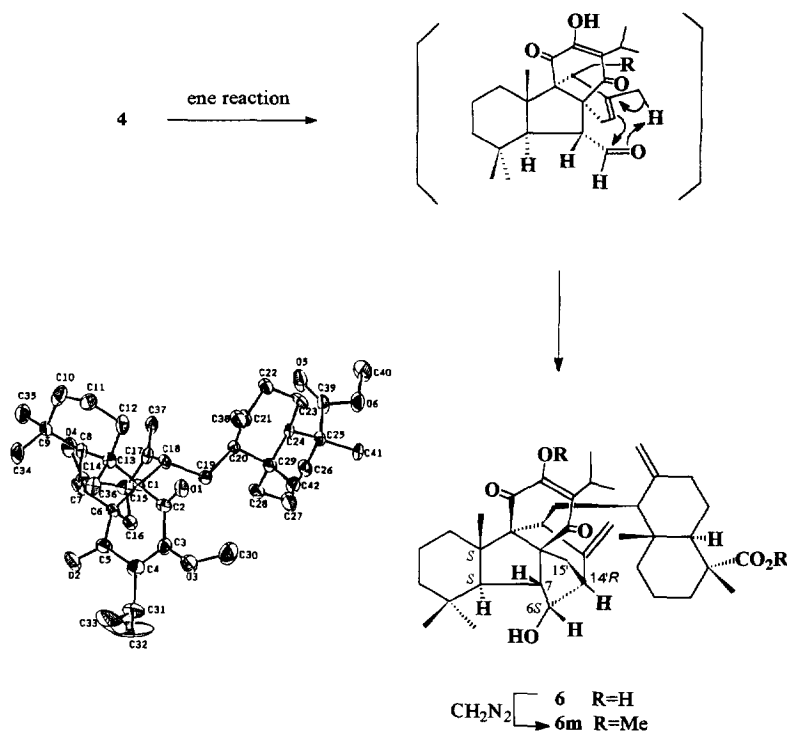
Table 2. ^{13}C and ^1H NMR data of compounds **3** and **4m–7m** (CDCl_3 , δ in ppm)

	3		4m		5m		6m		7m	
	δ_{C}	δ_{H}	δ_{C}	δ_{H}	δ_{C}	δ_{H}	δ_{C}	δ_{H}	δ_{C}	δ_{H}
1	32.7	1.55 (m), 1.68 (m)	34.8	1.88 (m)*	32.0	*	31.3	1.42 (m), 1.58 (m)	35.1	1.54 (m), 2.30 (m)
2	18.7	1.56 (m)*	18.3	*	18.0	*	18.3	1.46 (m)*	18.3	1.48 (m)*
3	41.5	1.15 (m)	41.5 (m)	0.96 (m), 1.30 (m)	41.4	1.38 (m), 1.10 (m)	41.7	0.86 (m), 1.32 (m)	41.0	1.08 (m), 1.38 (m)
4	33.9		33.7		33.8		34.2		33.6	
5	52.9	2.08 (d, 12.9)†	54.2	1.57 (d, 13.1)	54.5	1.79 (d, 12.7)	52.5	1.44 (m)	56.6	2.08 (m)
6	204.3	9.94 (d, 4.1)	205.4	9.60 (d, 4.6)	204.9	9.50 (d, 4.2)	72.7	3.99 (m)	204.4	9.87 (d, 5.5)
7	56.4	3.44 (dd, 12.9, 4.1)	56.2	3.10 (m)	58.7	3.14 (dd, 12.7, 4.2)	41.6	2.99 (t, 9.0)	52.5	3.31 (dd, 13.4, 5.5)
8	60.9		60.8		64.7		65.7		68.1	
9	63.4		65.9		60.2		66.0		143.7	
10	49.4		51.4		51.5		53.3		47.3	
11	198.5		198.6		199.3		198.0		142.9	
12	155.4		159.0		160.1		159.6		193.9	
13	131.4		141.3		144.0		140.9		66.2	
14	201.3		201.3		202.3		201.2		198.8	
15	25.4	3.17 (sept, 7.0)	26.4	3.10 (m)	25.3	3.30 (sept, 7.0)	25.7	3.10 (m)	27.1	2.16 (m)
16	18.8	1.14 (d, 7.0)	20.6	1.16 (d, 7.0)	20.1	1.22 (d, 7.0)	19.2	1.08 (d, 7.0)	17.9	0.96 (d, 7.0)
17	19.6	1.16 (d, 7.0)	19.3	1.07 (d, 7.0)	20.2	1.16 (d, 7.0)	20.4	1.15 (d, 7.0)	17.9	1.00 (d, 7.0)
18	35.6	0.77 (s)	35.7	0.69 (s)	35.3	0.75 (s)	37.0	0.84 (s)	34.5	0.78 (s)
19	21.9	0.85 (s)	21.9	0.75 (s)	21.9	0.78 (s)	22.8	0.75 (s)	21.7	0.85 (s)
20	19.6	0.73 (s)	20.1	0.63 (s)	22.3	0.73 (s)	20.2	0.60 (s)	19.6	0.99 (s)

1'	33.1	2.05 (m)	37.3	1.63 (m)*	37.3	*	37.7	1.42 (m)*	38.0	1.04 (m), 1.66 (m)
2'	120.6	2.34 (br d, 13.5)	19.0	*	19.3	*	19.4	*	19.3	1.66 (m)*
3'	140.6	5.39 (br d)	36.7	1.41*	36.9	1.44 (m), 1.50 (m)	36.7	1.48 (m)*	36.7	1.46 (m)*
4'	36.5	1.92 (m)	47.5	47.5	47.7		47.6		47.5	
5'	25.4	1.98 (m)	50.0	1.75 (m)	50.1	1.85 (m)	50.1	1.80 (m)	49.5	1.86 (m)
6'	123.5	4.95 (br s)	26.0	*	25.9	1.12 (m)*	26.8	1.14 (m), 1.36 (m)	26.4	1.07 (m), 1.32 (m)
7'	131.8		37.6	2.25 (m)*	37.8	1.90 (m)	37.8	1.86 (m)	37.3	1.86 (m), 2.22 (m)
8'	25.5	1.63 (s)	146.8		147.9	2.25 (br d, 12.6)	146.6	2.25 (br d, 12.0)	148.0	
9'	17.6	1.56 (s)	53.8	*	55.6	1.62 (m)	53.0	1.96 (m)	56.6	1.66 (m)
10'	34.7	2.23 (d, 14.2)	38.7		40.3		38.6		38.7	
11'		2.67 (d, 14.2)								
12'			26.7	*	26.6	1.28 (m)*	28.0	1.10 (m), 1.64 (m)	22.6	2.12 (m), 1.94 (m)
13'			40.3	3.10 (m)	49.5	2.20 (dd, 10.6, 3.9)	39.7	3.10 (m)	133.3	5.19 (br s)
14'			144.2		137.6		147.0		132.4	
15'			120.4	5.47 (br d, 6.3)	124.9	5.55 (br s)	46.5	2.60 (br s)	47.5	2.88 (t, 9.0)
			31.7	1.98 (m), 2.29 (m)	27.1	2.38 (br d, 18.0)	33.9	2.10 (br d, 12.0)	30.4	1.36 (m), 2.08 (m)
16'						2.84 (dd, 18.0, 6.8)		2.16 (br d, 12.0)		
17'			24.4	1.73 (s)	24.0	1.61 (s)	113.9	4.66 (s), 4.90 (s)	14.5	1.55 (s)
18'			108.7	4.58 (s), 4.87 (s)	107.0	4.62 (br s), 4.30 (br s)	108.8	4.78 (s), 4.90 (s)	107.8	4.73 (s), 4.36 (s)
19'			178.9		179.0		179.0		178.8	
20'			16.3	1.02 (s)	16.5	1.04 (s)	16.4	1.03 (s)	16.4	1.05 (s)
CO ₂ CH ₃			15.0	0.52 (s)	14.4	0.48 (s)	15.7	0.57 (s)	14.5	0.65 (s)
OCH ₃			51.8	3.56 (s)	51.9	3.61 (s)	51.8	3.57 (s)	51.7	3.57 (s)
			59.8	3.91 (s)	60.2	3.90 (s)	59.4	3.85 (s)		

*The signal of one or both protons was too weak to be assigned.

†Coupling constants (*J* in Hz) in parentheses.

Scheme 4. Formation of compound **6** and ORTEP drawing of compound **6m**.

Terpene **6** was treated with CH_2N_2 to give a crystalline bismethylated compound, **6m** ($\text{C}_{42}\text{H}_{60}\text{O}_6$), the structure of which was determined by an X-ray diffraction study along with other spectroscopic methods (IR, MS, and ^1H , ^{13}C , HMBC and HMQC NMR). The NOESY spectrum also supported the assigned stereochemistry. Compound **6**, namely taiwaniaadduct D, was presumably derived from the ene reaction (allyl-carbonyl coupling, for reviews see refs 7 and 8) of **4** (Scheme 4). The newly formed chiral centres had the (6*S*,14'*R*)-configuration.

Terpene **7** was treated with CH_2N_2 to give the corresponding methyl ester, **7m**, having a molecular ion $[\text{M}]^+$ at m/z 646.423 attributable to the molecular formula $\text{C}_{41}\text{H}_{58}\text{O}_6$. The structure of **7m** was determined by detailed analysis of the IR, MS, and ^1H , ^{13}C , HMBC and HMQC NMR spectra. H-14' was in the proximity of the aldehyde group as indicated by the NOESY spectrum. The stereochemistry was similarly assigned: NOE correlations of H-6 (δ 9.87) to H-5 (δ 2.08), H-7 (δ 3.31) to H-20 (δ 0.99), and H-12' (δ 5.19) to H-14' (δ 2.88) were observed. Compound **7**, namely taiwaniaadduct E, appeared to be derived from the [5 + 2] cycloaddition [9] between taiwaniaquinone A and *trans*-ozic acid with the formation of linkages at C8-C14' and C13-C15' (Scheme 5). The alternative [5 + 2] cycloaddition with the linkages at C8-C15' and C13-C14' was unfavourable presumably due to the severe repulsion between the isopropyl group at C-13 and the methyl group at C-13'.

In summary, diterpenes **1** and **2** having a 6-5-6 fused ring skeleton were found in *T. cryptomerioides*, in

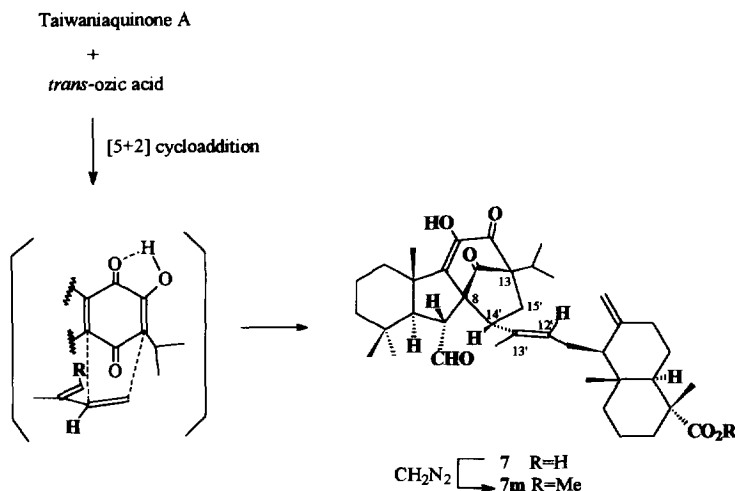
addition to the previously reported analogs from this plant source. Compounds **3–7** were derived from taiwaniaquinone A, β -myrcene and *trans*-ozic acid via [4 + 2] cycloaddition, [5 + 2] cycloaddition or an ene reaction. Since the enzymes for these reactions are not known in biological systems [10], compounds **3–7** are probably artefacts. It is, however, rather uncommon that combinations of taiwaniaquinone A with β -myrcene or *trans*-ozic acid occurred during the separation procedure.

EXPERIMENTAL

General. HPLC: Hibar Lichrosorb Si 60 column (10 μm , 25 cm \times 4 mm i.d.); TLC: Merck silica gel 60F sheets.

Plant material. The dried leaves (1.75 kg) of *T. cryptomerioides* were exhaustively extracted with Me_2CO (71 \times 3). The combined extracts were concd to ca 0.8 l, and taken up with CHCl_3 (0.8 l \times 3). The CHCl_3 -soluble portion was concd (55 g) and subjected to silica-gel CC. The portion obtained from elution of EtOAc-hexane (5–40%) was further subjected to flash chromatography and HPLC with elution of EtOAc-hexane (5–30%) or EtOAc- CH_2Cl_2 (10%) to give compounds **1** (42 mg), **2** (26 mg), **3** (256 mg), **4** (298 mg), **5** (45 mg), **6** (311 mg) and **7** (256 mg). Acids **4–7** were further transformed into their corresponding methyl ester derivatives **4m–7m**, which were purified by HPLC.

Taiwaniaquinone D (1). Red gum. $[\alpha]_D^{22} - 4.9^\circ$ (CHCl_3 ; c 2.1). TLC (5% EtOAc in hexane) R_f 0.34.



Scheme 5. Formation of compound 7.

IR ν_{\max}^{KBr} cm⁻¹: 3361, 1691, 1630; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 477 (756), 340 (6410), 226 (12 655); EIMS (70 eV) m/z (rel. int.): 328 [M]⁺ (36), 300 (20), 285 (58), 259 (100), 231 (14), 215 (8), 173 (6). HR-MS for C₂₀H₂₄O₄ requires: 328.1675. Found: 328.1678.

Taiwaniaquinone E (2). Yellow solid, mp: 79–81°, $[\alpha]_{\text{D}}^{22}$ –204° (CHCl₃; c 1.3). TLC (5% EtOAc in hexane) R_f 0.25. IR ν_{\max}^{KBr} cm⁻¹: 3383, 1735, 1635; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 431 (542), 341 (7911), 228 (15 488); EIMS (70 eV) m/z (rel. int.): 360 [M]⁺ (30), 300 (100), 285 (30), 244 (10), 231 (22), 217 (18), 189 (12). HR-MS for C₂₁H₂₈O₅ requires: 360.1937. Found: 360.1940.

Taiwaniadduct A (3). Solid, mp: 128–129°, $[\alpha]_{\text{D}}^{20}$ –106.3° (CHCl₃; c 12.8). TLC (5% EtOAc in hexane) R_f 0.27. IR ν_{\max}^{KBr} cm⁻¹: 3347, 1711, 1640; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 345 (4091), 290 (7017); EIMS (70 eV) m/z (rel. int.): 466 [M]⁺ (12), 449 (4), 384 (2), 300 (100), 257 (5), 231 (20), 217 (4). HR-MS for C₃₀H₄₂O₄ requires: 466.3085. Found: 466.3094.

Taiwaniadduct B (4). Compound 4 (298 mg) was treated with CH₂N₂ in Et₂O to give the bismethylated compound 4m (282 mg). Solid, mp: 158–160°, $[\alpha]_{\text{D}}^{25}$ –15.6° (CHCl₃; c 14.1). TLC (5% EtOAc in hexane) R_f 0.1. IR ν_{\max}^{KBr} cm⁻¹: 1713, 1657; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 304 (2309), 288 (2614), 204 (14 630); EIMS (70 eV) m/z (rel. int.): 661 [M + 1]⁺ (7), 660 [M]⁺ (1.5), 601 (1.5), 494 (40), 412 (7), 259 (15), 246 (100). HR-MS for C₄₂H₆₀O₆ requires: 660.4392. Found: 660.4391.

Taiwaniadduct C (5). Compound 5 (45 mg) was treated with CH₂N₂ in Et₂O to give the bismethylated compound 5m (40 mg). Solid, mp: 156–157°, $[\alpha]_{\text{D}}^{28}$ –82.3° (CHCl₃; c 2.0). TLC (5% EtOAc in hexane) R_f 0.1. IR ν_{\max}^{KBr} cm⁻¹: 1715, 1658; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 282 (5053), 202 (13 800); EIMS (70 eV) m/z (rel. int.): 660 [M]⁺ (10), 600 (5), 494 (18), 410 (25), 316 (85), 247 (50), 121 (100). HR-MS for C₄₂H₆₀O₆ requires: 660.4392. Found: 660.4390.

Taiwaniadduct D (6). Compound 6 (311 mg) was treated with CH₂N₂ in Et₂O to give the bismethylated compound 6m (288 mg). Crystals from MeOH–

CH₂Cl₂ (1:9), mp: 210.5–212.0°, $[\alpha]_{\text{D}}^{25}$ –60.1° (CHCl₃; c 14.4). TLC (5% EtOAc in hexane) R_f 0.1. IR ν_{\max}^{KBr} cm⁻¹: 3512, 1710, 1658; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 279 (8858), 202 (20 431). FAB (+) 661.7 [M + 1]⁺. HR-MS for C₄₂H₆₀O₆ requires: 660.4392. Found: 660.4343.

Taiwaniadduct E (7). Compound 7 (256 mg) was treated with CH₂N₂ in Et₂O to give the monomethylated compound 7m (222 mg). Solid, mp: 114–116°, $[\alpha]_{\text{D}}^{25}$ +25.3° (CHCl₃; c 11.1). TLC (5% EtOAc in hexane) R_f 0.1. IR ν_{\max}^{KBr} cm⁻¹: 3418, 1753, 1721, 1668, 1627; UV $\lambda_{\max}^{\text{MeOH}}$ nm (ϵ): 286 (7661), 202 (27 140). FAB (+) 647.3 [M + 1]⁺. HR-MS for C₄₁H₅₈O₆ requires: 646.4235. Found: 646.4225.

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