Pergamon

0031-9422(95)00253-7

Phytochemistry, Vol. 40, No. 1, pp. 191–193, 1995

0031-9422/95 $9.50 + 0.00

DOLABRANES FROM *ENDOSPERMUM DIADENUM*

ANAKE KIJJOA, MADALENA M. M. PINTO,* CHOOJIT ANANTACHOKE,† THOMAS E. GEDRIS‡ and WERNER HERZ‡

Laboratorio de Química, Instituto de Ciências Biomedicas Abel Salazar, Universidade do Porto, 4000 Porto, Portugal; *Departamento de Química Orgânica, Faculdade de Farmácia, Universidade do Porto, Portugal; †Forest Products Research Division, Royal Forest Department, Bangkok, Thailand; ‡Department of Chemistry, The Florida State University, Tallahassee, FL 32306, U.S.A.

(*Received* 23 *January* 1995)

Key Word Index—*Endospermum diadenum*; Euphorbiaceae; bark; wood; dolabranes; diterpenes.

Abstract—Further work on constituents of the bark of *Endospermum diadenum* furnished a new dolabrane, two new *nor*-dolabranes and C-veratroylglycol.

INTRODUCTION

In an earlier article we reported the isolation of three dolabrane type diterpenoids **1a**, **e**, **2a**, and the *norseco*-derivative **3a** from the wood of *Endospermum diadenum* Airy Shaw [1]. Further study of some of the fractions has now also led to identification of the analogue **1b** and the two *nor*-dolabrane carboxylic acids **1d** and **2d**. Isolation of mixtures of acetonides **1c** and **2c**, and acetonides **1c** and **3c**, which are undoubtedly artefacts, indicated that **2b** and perhaps **3c** are also secondary metabolites of *E. diadenum* although they were not isolated as such. A further constituent was the phenylpropanoid C-veratroylglycol (**4**).

The molecular formula of **1b** was $C_{20}H_{32}O_4$ based on the mass spectrum, the number of signals in the ^{13}C NMR spectrum (Table 1) and the proton count which indicated that 29 protons were attached to carbon. Comparison of the ^1H NMR (assignments by spin decoupling) and ^{13}C NMR spectra (Tables 1 and 2) with the ^1H and ^{13}C NMR spectra of **1e** [1] then clearly showed that the halogen of **1e** was replaced by a hydroxyl group, C-16 of **1b** having experienced the expected paramagnetic shift. In other respects the spectra were very similar.

That **1d** and **2d** were *nor*-dolabranes was clear from the mass and ^{13}C NMR spectra. In the latter, which contained only 19 signals (Table 1), the frequency of C-15 when compared with those of **1a** and **2a** had moved upfield to δ184.7 characteristic of a carboxylic acid while the singlets of C-13 were now found near δ41. Otherwise the ^1H and ^{13}C NMR spectra compared with those of **1a** and **2a**.

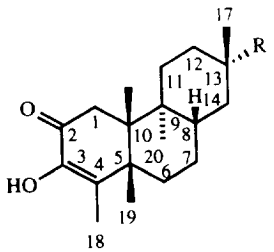
The mass spectrum of the mixture of acetonides **1c** and **2c** exhibited two peaks characteristic of the two molecular ions while the ^1H NMR spectrum exhibited signals characteristic of **1c** and **2c**, with additional signals due to the two methyls of the acetonide portion (see Experimental which also lists the properties of **4**). The mass spectrum of a second fraction corresponded to that of **1c**: However, the ^1H NMR spectrum taken somewhat later indicated the additional presence of **3c** whose proportion increased with time indicating that **3c**, like **3a** [1] was probably the product of air oxidation. The ABC systems of H-15, H-16a and H-16b in the ^1H NMR spectra of the two mixtures were difficult to analyse but at least in the case of the **1c**, **2c** mixture their complexity and the doubling of the signals due to H-17 indicated the presence of pairs of C-16 epimers.

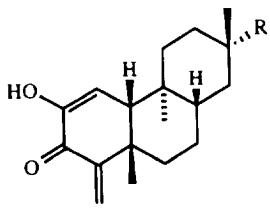
Table 1. ^{13}C NMR spectral data of compounds **1b**, **d** and **2d** (67.89 MHz, $CDCl_3$)

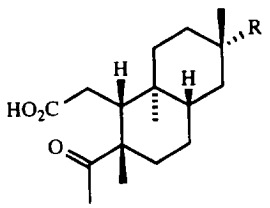
C	1b	1d	2d
1	38.0 *t*[a]	37.8 *t*[a]	117.4 *d*
2	193.0 *s*	192.9 *s*	148.7 *s*[a]
3	144.6 *s*	144.6 *s*	185.1 *s*
4	135.3 *s*	135.1 *s*	147.2 *s*[a]
5	39.0 *s*[b]	39.0 *s*[b]	41.9 *s*[b]
6	36.4 *t*[a]	35.7 *t*[a]	36.5 *t*[c]
7	26.9 *t*	26.5 *t*	25.2 *t*
8	41.3 *d*	41.6 *d*	40.4 *d*
9	38.1 *s*[b]	37.8 *s*[b]	37.9 *s*
10	54.5 *d*	54.3 *d*	55.3 *d*
11	33.9 *t*[c]	33.6 *t*	36.3 *t*[c]
12	28.4 *t*	28.5 *t*	28.5 *t*
13	36.5 *s*[b]	41.1 *s*	41.2 *s*[b]
14	33.2 *t*[c]	33.2 *t*[c]	34.6 *t*[c]
15	81.0 *d*	184.7 *s*	183.8 *s*
16	62.6 *t*	—	—
17	19.2 *q*	21.2 *q*	21.0 *q*
18	13.6 *q*	13.6 *q*	119.0 *t*
19	31.7 *q*	31.7 *q*	33.9 *q*
20	11.5 *q*	11.6 *q*	12.0 *q*

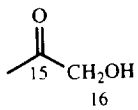
[a–c]Signals with the same superscript may be interchangeable.

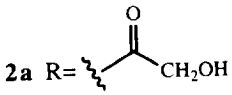
‡Author to whom correspondence should be addressed.

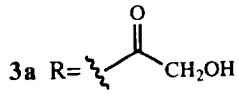


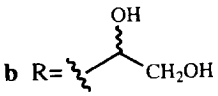


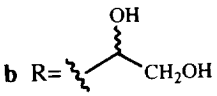


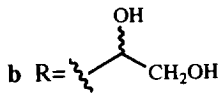
1a R= 

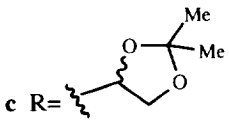
2a R= 

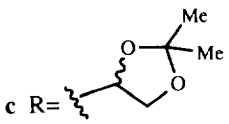
3a R= 

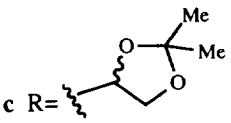
b R= 

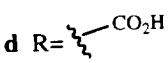
b R= 

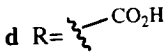
b R= 

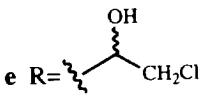
c R= 

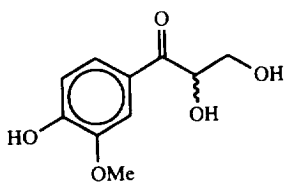
c R= 

c R= 

d R= 

d R= 

e R= 



4

EXPERIMENTAL

Extraction and isolation. Details concerning the extraction and fractionation of the $CHCl_3$ extract have been described previously [1]. Frs 38–44 of the original chromatogram (2.0 g) were combined and rechromatographed over silica gel using petrol–$CHCl_3$ as eluent, 100 ml frs being collected as follows: frs 1–2, petrol–$CHCl_3$ (4:1), frs 3–6, petrol–$CHCl_3$ (3:2), frs 7–28, petrol–$CHCl_3$ (3:7) and frs 29–36, petrol–$CHCl_3$ (1:9). Frs 8–29 (1.5 g) on purification by prep. TLC (3 runs, petrol–ETOAc–HCO_2H, 85:15:1) afforded 42 mg of **2d** and 67 mg of **1d**.

Frs 57–64 of the original chromatogram (1.9 g) on purification by prep. TLC ($CHCl_3$–Me_2CO–HCO_2H, 80:20:1) afforded 0.32 g of a mixture of **1c** and **2c** and 0.47 g of **1c** gradually converted to a mixture of **1c** and **3c**. Combination of frs 65–68 of the original chromatogram (1.7 g) and purification by prep. TLC ($CHCl_3$–Me_2CO–HCO_2H) afforded 22 mg of **1b** and 26 mg of **4**.

Ent-5α,2-Oxodolabr-3-ene-3,15,16-triol (**1b**). Mp 126–128°; PCI-MS *m/z* (rel. int.): 337 $[C_{20}H_{32}O_4 + H]^+$ (100), 319 (23.2); ^1H NMR: Table 1; ^{13}C NMR: Table 2.

Ent-16-nor-5α,2-Oxodolabr-3-ene-3-ol-15-oic acid (**1d**). Semisolid; PCI-MS *m/z* (rel. int.): 321 $[C_{19}H_{28}O_4 + H]^+$ (100); ^{13}C NMR: Table 1; ^1H NMR: Table 2.

Ent-16-nor-3-Oxodolabr-1,4(18)-diene-2-ol-15-oic acid (**2d**): Gum; PCI-MS *m/z* (rel. int.): 319 $[C_{19}H_{26}O_4$

Table 2. ^{1}H NMR spectral data of compounds **1b**, **d** and **2d** (500 MHz, $CDCl_3$)

H	1b	1d	2d
1α	2.69 *dd* (18.5, 2)	2.69 *dd* (19, 2)	6.15 *d* (6.5)
1β	2.81 *dd* (18.5, 6.5)	2.82 *dd* (19, 6.5)	—
6α	2.13 *ddd* (14, 3, 3)	2.14 *ddd* (14, 3, 3)	
6β	1.24 *ddd* (14, 13, 3)	1.25 *ddd* (14, 13, 2.5)	
7α	1.11 *m*	1.13 *m*	obsc.
7β	obsc.	obsc.	obsc.
8β	1.35 *m*	1.38 *dddd* (13, 13, 3, 3)	1.38 *dddd* (13, 13, 3, 3)
10β	1.61 *dd* (6.5, 2)	1.62 *dd* (6.5, 2)	2.01 *d* (7)
11α	1.63 *ddd* (13.5, 4.5, 3.5)	1.67 *m*	1.55 *ddd* (13, 3, 3)
11β	1.02 *ddd* (13, 13, 14)	1.06 *ddd* (13, 13, 4)	obsc.
12α	1.48 *ddd* (13, 5, 13, 4)	1.88 *dddd* (13.5, 13.5, 4)	1.83 *ddd* (14, 14, 4)
12β	1.3 *m*	1.45 *ddd* (13.5, 4, 3)	1.43 *m*
14α	1.35 *m*	1.69 *dd* (13, 13)	1.68 *dd* (13, 13)
14β	0.85 *m*	1.27 *dd* (13, 3.5)	1.22 *br d* (13)
15	3.29 *dd* (10, 2)	—	—
16a	3.70 *br d* (10, 2)	—	—
16b	3.49 *dd* (10, 10)	—	—
17*	0.91 *s*	1.21 *s*	1.23 *s*
18	1.85 *s**	1.85 *a**	6.22 *s*, 5.39 *s*
19*	1.20 *s*	1.24 *s*	1.10 *s*
20*	0.57 *s*	0.61 *s*	0.61 *s*
-OH	6.09 *br s*	6.15 *br s*	

*Intensity three protons.

+ H]$^+$ (67.3), 117 (100); ^{13}C NMR: Table 1; ^{1}H NMR: Table 2.

Mixture of **1c** *and* **2c**. Gum; PCI-MS *m/z* (rel. int.): 377 [$C_{23}H_{36}O_4$ + H]$^+$ (100), 375 [$C_{23}H_{34}O_4$] (57.2), 337 (20); ^{1}H NMR: δ3.85 (*c*, H-16a of both), 3.69 (*c*, H-15 and H-16b of both); 1.36 and 1.30 (each *s*, acetonide methyls common to **1c** and **2c**), 0.93 and 0.89 (each *s*, H-17 of C-16 epimers of **2c**), 0.92 and 0.86 (each *s*, H-17 of C-16 epimers of **1c**). Other signals were identical with those of **1b** and **2b** separately.

Mixture of **1c** *and* **3c**. Gum; PCI-MS 377 [$C_{23}H_{34}O_4$ + H]$^+$ (100); ^{1}H NMR after standing some time in $CHCl_3$ (500 MHz): acetonide methyl signals of **1c** and **3c** at δ1.37 and 1.30; H-15 and H-16a,b signals constituted a difficult to analyse ABC system with A (H-15) an apparent *dd* (*J* = 8, 6.5 Hz) at δ3.85, B centred at δ3.71 and C centred at δ3.68; other signals were those of **1c** and **3c** separately with those of **3c** increasing with time.

C-Veratroylglycol (**4**). Gum; PCI-MS *m/z* (rel. int.): 213 (100) [$C_{10}H_{12}O_5$ + H]$^+$ ^{1}H NMR (500 MHz, $CDCl_3$): δ7.52 (*d*, *J* = 2 Hz, H-2′), 7.48 (*dd*, *J* = 8, 2 Hz, H-6′), 6.97 (*d*, *J* = 8 Hz, H-5′), 6.16 (*br s*, − OH), 5.10 (*dd*, *J* = 5.5, 3.5 Hz, H-2), 3.99 (*dd*, *J* = 12, 3.5 Hz, H-3a), 3.95 (*s*, 3p, -OMe), 3.71 (*dd*, *J* = 12, 5.5 Hz, H-3b).

Acknowledgements—Work in Portugal was supported by the Junta Nacional de Investigação Cientifica. We thank Mr Carlos Q. de Oliveira for technical assistance.

REFERENCES

1. Kijjoa, A., Polónia, M. A., Pinto, M. M. M., Kirita Kan, T., Gedris, T. E. and Herz, W. (1994) *Phytochemistry* **37**, 285.