Rearrangement of Glaucolide A into Vernojalcanolide 8-O-Methacrylate

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The isolation of vernojalcanolide 8-O-methacrylate, a cadinanolide sesquiterpene from *Vernonia morelana* D.C. is described. The rearrangement of glaucolide A into vernojalcanolide 8-O-methacrylate is also reported. Biogenetic aspects are briefly discussed.

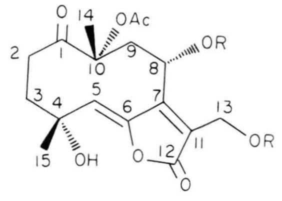
Introduction

The isolation of several of the first cadinanolide sesquiterpene lactones from *Vernonia* species [1] has been reported recently. At the same time it was proposed that enol lactones like **1** are the biogenetic precursors of cadinanolide sesquiterpene lactones [1]. We wish to report here the isolation of vernojalcanolide 8-O-methacrylate (**2**) from *Vernonia morelana* D.C. as well as its obtention by acid catalized rearrangement of glaucolide A (**4**).

Results and Discussion

The chloroform soluble fractions of the methanol extracts from the aereal parts of *Vernonia morelana* D.C., a shrub collected near Ixtapan de la Sal, México, were subjected to CC on Si-gel. The fractions eluted with hexane-AcOEt (1:1) afforded a crystalline compound, which after recrystallization from $CHCl_3$/isopropyl ether showed m.p. 198–200 °C and analyzed for $C_{24}H_{32}O_{11}$. The IR spectrum revealed the presence of an OH group (3450 cm^{-1}), an α,β-unsaturated γ-lactone (1760 cm^{-1}) and ester groups (1745 cm^{-1}, 1735 cm^{-1} and 1720 cm^{-1}). Its mass spectrum showed the molecular ion M^+ at *m/z* 496 and peaks showing the loss of a MeOH moiety, two acetic acid residues and one methacrylic acid unit. The ^{1}H NMR data of the isolated product are given in Table I and are compared with those reported for the oily acetate of vernojalcanolide 8-O-methacrylate 3 [1]. The comparison clearly established that the differ only by the acetate group at C-4, since the chemical shift of the 14-CH_3 is invariant in both molecules, while the 15-CH_3 signal appears at 1.40 ppm for **2** an at 1.77 ppm for **3**. This chemical shift difference is consistant with that shown upon acetylation of cadinolides at C-4 [1]. Furthermore, **2** has been isolated from *V. jalcana* collected in Perú, although no physical data have been given and only its transformation into **3** is mentioned [1].

Treatment of methanolic solutions of glaucolide A (**4**) in the presence of Si-gel under reflux for seven days yielded **2**. Therefore it seems that the cadinanolide sesquiterpene lactones appear to be ar-



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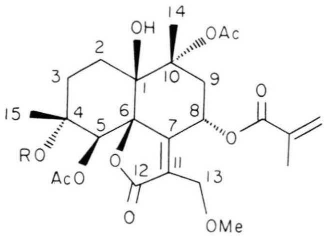

2 : R = H
3 : R = Ac

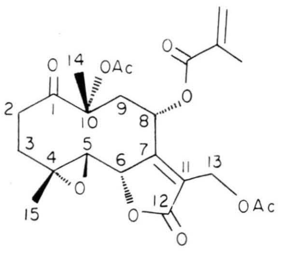

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Table I. ^{1}H NMR Spectral Data of **2** and **3**.

	2[a]	3[b]
H-2	2.36 m	2.38 m
H-2′	1.70 m	1.74 m
H-3	2,32 m	2.38 m
H-3′	1.86 m	2.72 m
H-5	5.87 s	6.13 s
H-8	5.77 dd	5.70 dd
H-9	3.47 dd	3.43 dd
H-9′	2.10 dd	2.12 dd
H-13	4.53 d	4.58 d
H-13′	4.26 d	4.27 d
H-14	1.71 s	1.71 s
H-15	1.40 s	1.77 s
OAc	2.16 s	2.15 s
	1.94 s	1.92 s
		1.89 s
OMe	3.35 s	3.34 s
OR	5.98 dq	5.99 dq
	5.61 dq	5.62 dq
	1.91 br	1.95 br

[a] At 300 MHz; J(Hz): 8, 9 = 2; 8, 9′ = 4.6; 13, 13′ = 12.3; 9, 9′ = 15. Shifts for protons at C-2 and C-3 are approximate.

[b] At 400 MHz from ref [1]; J(Hz): 2, 2′ = 15; 2, 3 = 4.5; 2, 3′ = 3; 2′, 3 = 15; 2′, 3′ = 5; 3, 3′ = 14; 8, 9 = 2; 8′, 9′ = 4; 13, 13′ = 11.5; 9, 9′ = 15.

tifacts of the glaucolide type compounds, rather than natural products. Furthermore, room temperature extractions of *V. morelana* with ethyl acetate, only yielded glaucolide A (**4**). Thus the proposal [1] that enol lactones like **1** are the biogenetic precursors of the cadinanolide lactones needs revision.

Experimental

Mps. are uncorr. IR spectra were recorded in CHCl$_3$ and UV in 95% EtOH. ^{1}H NMR and ^{13}C NMR spectra were recorded in CDCl$_3$, using TMS as int. standard and chemical shifts are giving in δ. Analysis was determined by the Franz Pascher Laboratories, Bonn, Germany. Voucher specimens are deposited at the Herbarium of the Instituto de Biología de la Universidad Nacional Autónoma de México.

*Isolation of vernojalcanolide 8-O-methacrylate (**2**)*

Dried and ground leaves (887 g) of *Vernonia morelana* collected near Ixtapan de la Sal, México in April 1978, were extracted with MeOH under reflux and worked up in the usual manner [2]. The CHCl$_3$ soluble fractions (73 g) were chromatographed on Si-gel. Elution with hexane-AcOEt (1:1) gave 97 mg of **2** m.p. 198–200 °C (CHCl$_3$-isopropyl ether), UV λ máx nm 215 (ε, 15873, IR ν máx cm^{-1}: 3450, 1760, 1745, 1735, 1720, 1650. (Found C, 58.05; H, 6.50; O, 35.45% $C_{24}H_{32}O_{11}$ requires C, 57.97; H, 6.50; O, 35.90%) MS *m/z*: 496 M$^+$, 464, 404, 318, 258, 69, 43 (100%).

*Isolation of glaucolide A (**4**)*

Dried and ground leaves (900 g) of *Vernonia morelana* collected in the same locality were extracted with AcOEt at room temperature. The AcOEt extract (60 g) was chromatographed on Si-gel. Elution with hexane-AcOEt (2:1) gave 200 mg of glaucolide A (**4**), which after recrystallization were identified by standard spectral method (UV, ^{1}H NMR, MS).

*Obtention of 2 from glaucolide A (**4**)*

A solution of 900 mg of glaucolide A (**4**) in 75 ml of MeOH was refluxed over Si-gel (60 g). After seven days the reaction mixture was filtered and concentrated under vacuum. Chromatographic separation on Si-gel using hexane : AcOEt (1:1) as the elution mixture yielded 105 mg of **2**.

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[2] M. Martínez, A. Romo de Vivar, E. Díaz, M. Jiménez, and L. Rodríguez-Hahn, Phytochemistry **21,** 1335 (1982).