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7α,11β-DIACETOXYDIHYDRONOMILIN, A NEW TETRANORTRITERPENOID FROM <u>CEDRELA MEXICANA</u>

G.B. Marcelle[1] and B.S. Mootoo*
Department of Chemistry, University of the West Indies,
St. Augustine, Trinidad, W.I.

Abstract: Spectroscopic and chemical evidence is presented in support of the structure of 7α,11β-diacetoxydihydronomilin (I) obtained from a benzene extract of the dehisced fruit capsules of Cedrela mexicana.

A variety of related tetranortriterpenoids has been reported from the heartwood of Cedrela mexicana collected in Jamaica[2], Trinidad[3] and West Africa[4].

We wish to report a new compound 7α,11β-diacetoxydihydronomilin (I) from the dehisced fruit capsules of this plant collected in Trinidad. This is a unique addition to the increasing number of seco-ring A tetranortriterpenoids recently reported, e.g. 7α-acetoxydihydronomilin[5], tricoccin S_{13}[6], evodulone[7] and surenone and surenin[8].

Isolation:

The benzene extract of 2.3 kg of ground material yielded 31.2 g of a gummy residue from which was obtained 10.5 g of a petroleum ether insoluble precipitate. Repeated PLC on silica gel with acetone/petroleum ether (1:2) yielded a crystalline compound m.p. 240° - 45° (ethyl acetate/petroleum ether) which analysed for $C_{32}H_{40}O_{12}$, [calc. C 62.32, H 6.54, found C 62.07, H 6.55]. Crystallisation from methanol gave m.p. 262 - 64° with methanol of crystallisation.

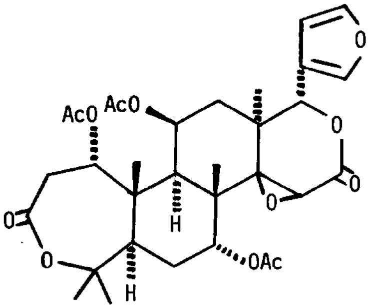
Structure:

The IR (nujol) spectrum showed a broad band centred at 1740 cm^{-1} (ester, lactone) and one at 870 cm^{-1} (β-substituted furan). The ^1H-NMR (270MHz, $CDCl_3$, δppm) confirmed the β-substituted furan (6.30, 7.39, 7.43, 1H each) and further indicated five tertiary methyl groups (1.20, 1.35, 1.39, 1.44, 1.50) and three secondary acetate groups (2.06, 2.10, 2.12).

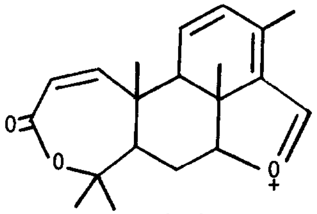
The corresponding protons on the acetate bearing carbons could be located as follows - C_1-H, 4.85 (d, J=6.5Hz), C_7-H, 4.53(s)[9] and the C_{11}-H, 5.19 (quintuplet, $w^{\frac{1}{2}}$ = 21Hz)[10]. The assignment of the C_1-proton was further confirmed by double irradiation at 3.20 when it collapsed to a singlet. The C_{15}-H was located at 5.35(s) and the C_{17}-H at 5.60(s).

In addition the remaining eight protons in the molecule could be assigned as follows: the C_2-protons, 3.20 (2H, m); C_9-H, 2.89 (1H, d); C_5-H, 2.45 (1H, quartet); C_{12}-H, 2.32 (1H, quartet); C_{12}-H, 1.92 (1H, quartet) and the two C_6 protons, 1.63 (2H, s).

The C_{17}-H at 5.60 together with the C_{15}-H at 3.60 confirmed the epoxy-δ-lactone structure for ring D in combination with a C_7-α-OAc[11].



(I)



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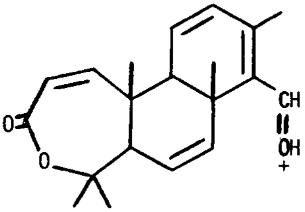

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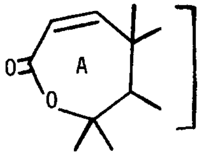

(IV)

The remaining two oxygen atoms are accounted for by the ring A lactone structure. The latter is supported by the following evidence:-

(a) the low field positions of the five tertiary methyl groups (1.20 - 1.50);

(b) the peak in the ms at m/e 255 which can be obtained from either of the readily formed ions of m/e 313, (II) or (III) by loss of acetone from ring A[12].

The structure of ring A was confirmed by the treatment of compound (I) with Al_2O_3 (neutral, super Grade I, Woelm). When the compound was stirred with Al_2O_3 at RT in benzene for 2.5 hours the product obtained was the α,β-unsaturated lactone (IV)- λ_{max} [EtOH] 215 nm

(ϵ, 16,000) compared with compound (I) - λ_{max} [EtOH] 213nm (ϵ, 6,000); ν_{max} (Nujol) - 1740 cm^{-1}, shoulder at 1690 cm^{-1}; ^{1}H-NMR (60MHz, $CDCl_3$, δppm) - two secondary acetates (2.01, 2.10) with the corresponding protons at 4.57 (broadened singlet) and 5.60 (m), the latter overlapping with the C_{15}-H. Two new doublets corresponding to the C_1 and C_2 protons of the α,β-unsaturated lactone were centred at 6.30 (d, J=13Hz) and 5.90 (d, J=13Hz) respectively.

The -OAc group at C_1 has been assigned an α-configuration. Hydroxy or acetyl functions at this position in limonoids are usually α[13] and an X-ray structure has recently confirmed this configuration in 7α-acetoxydihydronomilin[5]. Dreyer[9] had proposed a β-configuration in nomilin for which compound he reported a quartet for the C_1 proton (60MHz). We also obtained a quartet using a 60MHz instrument for the C_1-H in nomilin and what appeared to be a badly resolved triplet for the corresponding proton in compound (I). Ahmed et al[5] have quoted the two protons on the acetate bearing carbons as multiplets at 4.84 and 4.50 in 7α-acetoxydihydronomilin.

When measured on a 270MHz instrument the C_1-H of nomilin appeared as a distinct doublet at 5.04 (J=6.5Hz), coincided in shape with the C_1-H of compound (I) (d, 4.85, J=6.5Hz), and like this proton in compound (I), collapsed to a singlet on irradiation at 3.20.

The seven-membered lactone ring A is very flexible and the shape of the C_1 proton in the NMR does not allow a conclusive assignment of the configuration at this carbon. However, if we assume the chair configuration of ring A in which C_2-C_3-O-C_4 are in the same plane (cf. X-ray evidence for 7-acetoxydihydronomilin)[5], an α-configuration for the C_1-OAc will result in dihedral angles of approximately 30° and 90° between the C_1-β-proton and the two protons at C_2 and account for the C_1-β-proton in both nomilin and compound (I) appearing as a doublet (J=6.5Hz, 270MHz).

Investigations are continuing on the crude extract of the dehisced fruit capsules of Cedrela mexicana, since, in addition to 7α,11β-diacetoxydihydronomilin, TLC shows other compounds which have not been previously isolated from this plant.

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