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TERPENOIDS-V.[1] MELIANONE FROM MELIA AZEDARACH L.

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Melia azedarach L. (Meliaceae) is an ornamental tree bearing berry - like fruit known for its poisonous properties; the leaves of the tree are reputed to be insecticidal.[2] From an extract of the total ground fruit* a crystalline compound melianone, m.p. 223-224° and 232-233° (isomorphic forms) $[\alpha]_D$-62° has been isolated. Analysis and mass-spectrometry indicate the empirical formula $C_{30}H_{46}O_4$ ($M^+ = 470$) for which structure I is proposed.

The infrared spectrum has the following characteristic bands: ν^{KBr}_{max} 3340 (OH), 1709 (six membered ring ketone) 1639 and 820 (trisubstituted double bond), and 1242 (ether linkage) cm.$^{-1}$, however, the NMR spectrum of melianone was most informative. At high field a set of signals could be related to seven methyl groups, two of which overlap at δ 1.30 and are related to the C_{26} and C_{27} methyl groups, while a doublet at δ 2.90 (J = 8 c.p.s.) is due to the C_{24} proton. Following the addition of D_2O a double triplet centered at δ 3.39 (8 c.p.s. apart) was disclosed and related to the C_{23} proton. Downfield, a two proton signal at δ 5.38 was eventually shown to be due to the overlapping of the C_7 vinylic proton with that of the C_{21}-H.

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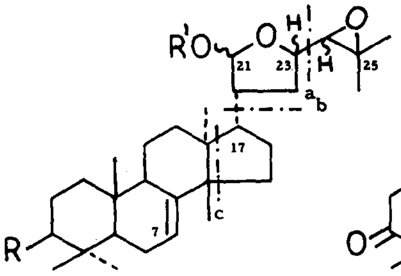
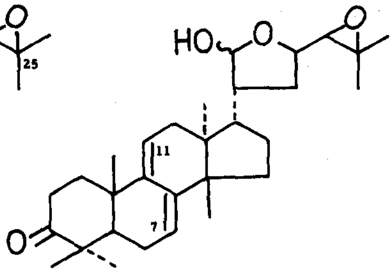


I. R = O, R' = H

II. R = O, R' = Ac



III

Acetylation of melianone with acetic anhydride in pyridine (one hour at room temperature) gave a monoacetate (II) in which the signal of the C_{21}-H was now shifted downfield to δ 6.20 (doublet, J = 3 c.p.s.) disclosing the C_7 vinylic proton alone at δ 5.31.

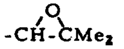
Melianone (I) reacted with 2,4-dinitrophenyl-hydrazine to give a hydrazone, $\lambda_{max.}^{EtOH}$ 365 mμ (ε= 21, 500). Upon oxidation with chromium trioxide in pyridine a compound having a five membered ring lactone, $\nu_{max.}^{CHCl_3}$ 1776 cm.$^{-1}$ was obtained, thus placing the hydroxyl group in a cyclic hemiacetal structure, and suggesting thereby a similarity to flindissol.[3]

With sodium borohydride (3 hrs. at 5°) I was reduced to a triol with no absorption band in the carbonyl region of the infrared spectrum; upon acetylation it gave a triacetate having a 9 proton signal at δ 2.04 for the three $OCO\underline{CH_3}$.

The double bond (end absorption in the ultraviolet) was found to be inert to hydrogenation even under rather forcing conditions; however, convincing evidence for its location at C_7 was deduced by the dehydrogenation of the above triacetate with mercuric acetate[4] yielding the 7,9(11)-heteroannular diene (III) having the following ultraviolet spectrum: $\lambda_{max.}^{EtOH}$ 231.5, 239.0 and 247 mμ (ε = 8900, 9950, 6650) which is characteristic for a euphol type skeleton[5], and thereby sets the stereochemistry of the nucleus.

Melianone shows a negative Cotton effect, $[\Phi]_{315}$ -2250°, $[\Phi]_{275}$ +150° the ORD curve being superimposable on that of flindissone lactone,[3] thus supporting the position of the double bond and indicating the relative configuration of rings A and B.

Evidence for the presence of a $C_{24,25}$ epoxy ring was obtained by the treatment of melianone with hydrobromic acid in glacial acetic acid, yielding the 24-acetoxy-25-bromo derivative.[6] In the NMR spectrum of this derivative the doublet centered at δ 2.90 had disappeared, while the two C_{26} and C_{27} methyl groups now adjacent to the bromine atom were shifted downfield appearing as two separate signals at δ 1.65 and 1.67. The acetoxy group was disclosed by a three proton singlet at 2.03, while the adjacent proton gave rise to a doublet at δ 4.12 (J = 7 c.p.s.). During this reaction, the double bond migrated to C_8 and no signal for a vinylic proton could therefore be detected.

Corroborative evidence for the proposed structure was adduced from the mass-spectrum of melianone.** The peak at m/e 399 (M-71) results from the loss of the fragment  $\text{-}\overset{O}{CH\text{-}CMe_2}$ (cleavage a), and that at

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** We thank Dr. N. Danieli from our department for the measurements.

m/e 312 from the loss of the whole side chain ($C_8H_{13}O_3$ = 157) together with a hydrogen atom (cleavage b); the ion m/e 297 is (M-157-CH_3) while the one at m/e 271 is due to the loss of the side chain with a three carbon atom fragment from ring D (M-199), (cleavage c).

While these results were collected for publication, the closely related structure of turraentin was disclosed.[7]

REFERENCES

1. Part IV, D. Lavie, B.S. Benjaminov and Y. Shvo, Tetrahedron, 20, 2585 (1964).
2. J.M. Watt and M.G. Breyer-Brandwijk, "The Medicinal and Poisonous Plants of Southern and Eastern Africa". E. & S. Livingstone Ltd., Edinburgh and London 1962, p. 745. A.J. Feuell, "Insecticides", Weinheim Verlag von J. Cramer 1965, p. 107.
3. A.J. Birch, D.J. Collins, Sultan Muhammad and J.P. Turnbull, J. Chem. Soc., 2762 (1963).
4. W.V. Ruyle, T.A. Jacob, J.M. Chemerda, E.M. Chamberlin, D.W. Rosenburg, G.E. Sita, R.L. Erickson, L.M. Aliminosa and M. Tishler, J. Amer. Chem. Soc., 75, 2604 (1953).
5. T.G. Halsall, G.D. Meakins and R.E.M. Swayne, J. Chem. Soc., 4139 (1953).
6. R.E. Parker and N.S. Isaacs, Chem. Rev., 59, 737 (1959).
7. C.W.L. Bevan, D.E.U. Ekong, T.G. Halsall and P. Toft, Chem. Commun., 636 (1965).