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STEROID ALKALOIDS FROM MALOUETIA ARBOREA MIERS. AND MALOUETIA TAMAQUARINA (AUBL.) A. DC.*

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Of the little investigated genus Malouetia (Apocynaceae) only African Malouetia bequertiana Woods. has been subjected to detailed investigation by Janot, Goutarel and coworkers (1, 2). The French workers succeeded in isolation of eight steroid alkaloids (malouetine, funtuphyllamine B and C, funtumafrine C, malouphyllamine, chinemorphine and malouphyllinine) belonging to the pregnane and conanine series. The presence of funtumafrine C and funtuphyllamine B in South-American Malouetia glandulifera Miers. has been also reported (3). Thus, the presence of alkaloids known as typical of Holarrhena and Funtumia, was also demonstrated in Malouetia.

We wish to report the isolation of further steroid bases, including new alkaloids malarborine and malarboreine, from South-American species Malouetia arborea Miers. and Malouetia tamaquarina (Aubl.) A. Dc. which confirms the close relationship between all three genera and extends the number of alkaloid types characteristic of the holarrhimine and conkurchine bases.

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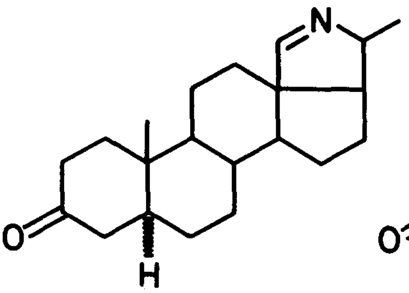
* We wish to thank Dr. R. B. Raffauf and the Natural Products Group of Smith Kline and French Laboratories, Philadelphia, U.S.A. for samples of the total non-quaternary bases of these plants.

__Malouetia arborea__[*] was extracted with alcohol. After removal of the solvent the residue was triturated several times with 2% tartaric acid. The acid solution was made basic with ammonia and extracted with chloroform. The dried chloroform solution was evaporated to yield the total non-quaternary bases of the plant which were then separated into weak and strong components by counter-current distribution between dilute (5%) acetic acid and chloroform.

Chromatography of the less basic chloroform portion on silica gel in benzene-ether (7:3) saturated with ammonia (4, 5) yielded two main alkaloid fractions. The less polar fraction on repeated chromatography, crystallization from cyclohexane and sublimation at 130 - $135^{\circ}/5.10^{-4}$ mm/Hg yielded malarborine (I), $C_{21}H_{31}NO$ (313.5), m.p. 164-165.5°, ν_{max}^{KBr} 1710 cm^{-1}, m.w. 313 (mass spectrometry). The structure I was proved by comparison of the IR-spectrum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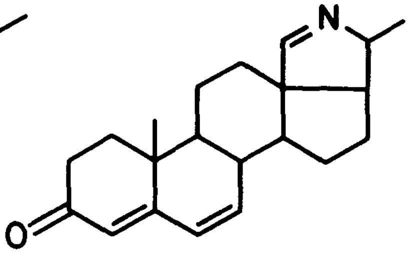
II

and chromatographic migration rate with those of the authentic sample (m.p. 165-167°, $[\alpha]_D \pm 0^{\circ}$) prepared by partial synthesis (5) from holarrhimine.

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[*] __M. arborea__ was collected at Sumare, near Rio de Janeiro, and a reference specimen is on the file at the Botanical Garden, Rio de Janeiro under the number R. B. 2187.

The more polar fraction on crystallization from light petroleum and repeated sublimation at 130-160°/5.10^{-3} mm/Hg gave malarboreine (II), $C_{21}H_{27}NO$ (309.4), m.p. 173-176°, $[\alpha]_D$ + 57° (EtOH)[*]. The presence of $\Delta^{4,6}$-dien-3-one system indicated by the UV-spectrum (λ_{max}^{EtOH} 283 mμ, log ε 4.30; calcul. λ_{max}^{EtOH} 280 mμ) was confirmed by the RD-curve (c 0.28, EtOH, 26°; Φ_{308} -11300, Φ_{314} -13170°, Φ_{350} ± 0°, Φ_{375} + 5210°, Φ_{589} +57°; a +184) showing close resemblance to the RD-curve of ergosta-4,6,22-trien-3-one (6). The structure II was confirmed by 100 Mc n.m.r. spectroscopy ($CDCl_3$) : n.m.r. signals at δ = 1.16 ppm (3 H, singlet; one tert. CH_3), 1.37 ppm (3 H, doublet, J 6.5 cps; one sec. CH_3), 4.08 ppm (1 H, multiplet; $HC{=}N{-}C\underline{H}{-}CH_3$ coupled to 20-methyl and 18-proton as shown by spin-decoupling experiment), 7.64 ppm (1 H, doublet; $-C\underline{H}{=}N{-}CH{-}CH_3$). The pattern represented by the last two signals is characteristic of conkurchine-type alkaloids (cf. 7). The signals of the olefinic protons appear at δ = 5.68 ppm (1 H, singlet; 4-proton) and at 6.12 ppm (2 H, singlet; 6- and 7-protons).

The strong base fraction after chromatography on silica gel using ether saturated with ammonia as eluens (4) yielded conkurchine (III) $C_{21}H_{32}N_2$ (312.5), m.p. 151-153°, $[\alpha]_D$ - 60°; reported m.p. 152.5-153° (8), $[\alpha]_D$ - 43° (EtOH) (9).

Malouetia tamaquarina[**] was extracted with alcohol. The residue after removal of the solvent was triturated several times with 0.2 N H_3PO_4 and the combined acid extracts were made alkaline with ammonia and extracted with chloroform. The total non-quaternary bases were methylated with formaldehyde-formic acid according to the procedure used for the *Holarrhena* bases cf. (10, 11). The bases were extracted with methylene chloride and separated

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[*] Unless stated otherwise, all optical rotations were measured in chloroform.

[**] *M. tamaquarina* was collected at Puerto Narino, Colombia, and a voucher specimen has been deposited with Prof. R. E. Schultes, Curator, Botanical Museum, Harvard University, Cambridge, Mass.

by chromatography on silica gel in benzene (saturated with ammonia) solution. The following alkaloids were obtained: a) kurchessine (IV), $C_{25}H_{44}N_2$ (372.8), m.p. 138.5 - 139.5° (EtOH), $[\alpha]_D$ - 40°, mass spectrum cf. (12, 13) : M 372, base peak at m/e 72 $[20\text{-}N(CH_3)]_2$, intense peak at m/e 84 $[3\text{-}N(CH_3)_2]$, reported (11) m.p. 140 - 141°, $[\alpha]_D$ - 37°; b) 3β,20α-bisdimethylamino-5α-pregnane (dihydrokurchessine (V), $C_{25}H_{46}N_2$ (374.8), m.p. 104-107° (acetone), reported (14) m.p. 107-108°, mass spectrum: M 374, base peak at m/e 72, intense peaks at m/e 84 and 110; c) conessine $C_{24}H_{40}N_2$ (356.6), m.p. 124.5-125.5° (acetone), $[\alpha]_D$ -2°; reported (15) m.p. 125-126.5°, $[\alpha]_D$ ± 0°.

Elution with ether yielded tetramethylholarrhimine (VII), $C_{25}H_{44}N_2O$ (388.6), m.p. 229-233° (EtOH), $[\alpha]_D$ -35°; reported (16) m.p. 227-229°, $[\alpha]_D$ -35°.[*]

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[*] The elementary analyses of compounds I-IV, VI and VII are in agreement with the assigned structures. The identity of these compounds was established by comparison with the IR-spectra of authentic samples and mixed m.p. determinations. The base V could not be analysed for insufficient quantity.

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