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CHEMISTRY OF *HYPTIS SUAVEOLENS*: A PENTACYCLIC TRITERPENE

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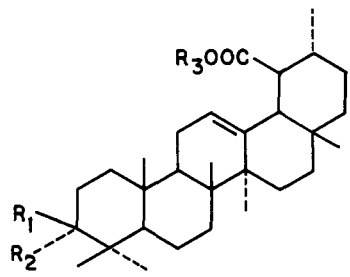
Hyptis suaveolens Poit. (Labiatae) is widely used as an indigenous drug (1-4) in various ailments. Previous workers reported the isolation of diterpenoids (5), several steroids (6), and triterpenoids (7). The present investigation on the aerial parts of this plant led to the isolation of a new pentacyclic triterpene (**1**).

The concentrated petroleum ether (60-80°) extract of the aerial parts of *H. suaveolens* on systematic chromatographic analysis furnished a solid which, on repeated crystallization from EtOAc-hexane (1:3) mixture, gave colorless plates, mp 182-185°. It responded positively to the Leibermann-Burchardt test for triterpenes, and its ir spectrum exhibited absorption bands at ν max 3440 (hydroxyl), 1730 (carboxyl), and 1650 cm^{-1} (unsaturation). On acetylation with Ac_2O and pyridine at room temperature, it formed an amorphous acetate, $C_{32}H_{50}O_4$ (**2**) and a methyl ester, $C_{32}H_{50}O_3$ (**3**), mp 160-163°, on treatment with CH_2N_2. The pmr spectrum (90 MHz, $CDCl_3$) of the parent triterpene displayed signals at δ 0.63 (3H, s), 0.76 (6H, s), 0.90 (3H, s), 0.98 (3H, s), and 1.25 (3H, s) for six tertiary methyl groups, one secondary methyl appearing as a doublet around δ 1.12 (3H, J=6 cps); one vinylic proton at δ 5.28 (1H, m) and one proton multiplet around δ 3.58 assignable to >*CH*OH, as expected for the urs-12-ene skeleton with a hydroxyl substituent.

The mass spectral fragmentation pattern of this triterpene is typical of the Δ^{12}-ursene skeleton (8) and recorded fragmentation peaks at *m/z* 248 (base peak) retro Diels-Alder fragmentation around ring C), 207 (M^+-248-H), 203 (248-COOH), 202 (248-HCOOH), and 189 (207-H_2O), besides the molecular ion peak at *m/z* 456. From the above mass fragmentation pattern, it is evident that the secondary hydroxyl group is present in the A/B ring portion, and its location at C-3 is highly probable on a biogenetic basis. Moreover, its equatorial (β) disposition (9) is revealed from the appearance of the axial methine proton signal at δ 3.58 in the pmr spectrum of the triterpene (**1**) and from the shifting of this methine proton signal to δ 4.50 in the pmr spectrum of the acetate (**2**). The appearance of the fragment ion peak at *m/z* 248 as the base peak reveals that the carboxyl group is located in the D/E rings. The presence of only one secondary methyl group [signal at δ 1.12 (3H, d, J=6 cps) in the parent triterpene (**1**); δ 1.10 (3H, d, J=7 cps) in the acetate (**2**)], instead of two secondary methyl groups as expected for ursane skeleton, definitely suggests that the carboxyl group is located at either C-29 or at C-30. Finally, conversion of this triterpene to bryononic acid, 3-oxo-urs-12-en-29-oic acid (**4**) (10), mp 235-239°, by chromic acid oxidation of its methyl ester (**3**) followed by hydrolysis, led us to formulate this triterpene as urs-12-en-3β-ol-29-oic acid (**1**). In this connection, it may be appropriate to men-



1, R_1=OH, R_2=H, R_3=H.
2, R_1=OAc, R_2=H, R_3=H.
3, R_1=OH, R_2=H, R_3=CH_3.
4, R_1, R_2=O, R_3=H.

tion here that the so-called bryonolic acid, $C_{30}H_{48}O_3$, mp 305°, isolated from *Bryonia dioica,* was originally assigned the structure, urs-12-en-3β-ol-29-oic acid (11, 12). However, later on, it was revised as glut-8-en-3β-ol-29-oic acid (13).

EXPERIMENTAL[1]

PLANT MATERIAL.—The aerial parts of *H. suaveolens* were collected and supplied by United Chemical & Allied Products, Calcutta, India. A voucher specimen has been placed in the herbarium of the Phytochemical Research Laboratory, Department of Chemistry, Visva-Bharati University, Santiniketan, India.

EXTRACTION OF *H. SUAVEOLENS*.—Air-dried, finely powdered aerial parts of the plant (1 kg) were extracted with petroleum ether (60-80°) in a Soxhlet for 48 h. The extract (85 g) was subjected to column chromatography on 200 g silica gel (mesh 60-120).

ISOLATION OF URS-12-EN-3β-OL-29-OIC ACID (**1**).—C_6H_6-$CHCl_3$ (1:3) eluate yielded urs-12-en-3β-ol-29-oic acid. It crystallized from EtOAc-hexane (1:3) mixture (300 mg), mp 182-185°; ir (KBr) ν max 3440, 2940, 1730, 1650, 1430, 1385, 1265, 1050, and 990 cm^{-1}; pmr ($CDCl_3$) and ms are described in the text.

ACETYLATION OF **1**.—The compound **1** (40 mg) was dissolved in 5 ml Ac_2O and 0.5 ml pyridine, and the reaction mixture was kept at room temperature for 4 days. The reaction mixture was then poured into cold H_2O, extracted with Et_2O, and dried when the amorphous acetate (**2**) was obtained (48 mg). Ir (KBr) ν max 2955, 1735 (acetyl), 1730 (carboxyl), and 1640 cm^{-1} (unsaturation); pmr ($CDCl_3$) δ 0.68 (3H, s), 0.72 (6H, s), 0.90 (3H, s), 0.93 (3H, s), 1.10 (3H, d, J=7 cps), 2.02 (3H, s -OCOC*H*$_3$), 4.50 (1H, m), and 5.20 (1H, m).

METHYL ESTER (**3**) OF **1**.—The triterpene (50 mg) dissolved in MeOH and methylated with excess CH_2N_2 in Et_2O at 5°, crystallized from $CHCl_3$-MeOH (1:1), mp 160-163°. Ir (KBr) ν max 3450 (-OH). 1740 (ester carbonyl), and 1645 cm^{-1} (unsaturation).

JONES' OXIDATION OF **3** AND HYDROLYSIS OF THE PRODUCT.—The methyl ester (**3**, 40 mg) was dissolved in 15 mg HOAc, and to it, a solution of chromic acid (20 mg) in 5 ml HOAc was added. The mixture was refluxed for 2 h at 50°, cooled, filtered, and the filtrate was acidified with HCl in the cold. The precipitate was dissolved in Et_2O, dried, and the E_2O removed to leave a crude solid, which, on repeated column chromatography over 50 g silica gel (mesh 60-120), furnished a solid. This was dissolved in 10 ml of 20% ethanolic KOH and refluxed for 8 h, the solvent removed, H_2O added, and the mixture filtered. The filtrate was acidified with HCl and extracted with Et_2O. The extract was washed with H_2O until free from acid, dried, and the solvent distilled to leave bryononic acid, $C_{30}H_{46}O_3$ (**4**), mp 235-239° crystallized from MeOH.

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[1]All mps are uncorrected.