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PARTIAL SYNTHESIS OF SYRIOGENIN

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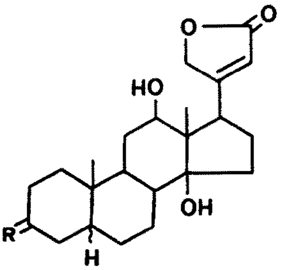
In 1962 L.Masler et al.(1) assigned to the aglycone syriogenin the structure (I) of 3β,12β,14β-trihydroxy-5α-$\Delta^{20(22)}$-cardenolide essentially from spectroscopic and rotation data; however Reichstein et al.(2) raised doubt on the location at C-12 of the second hydroxyl group of syriogenin on the basis of the mass-spectrum of the compound. We proved by degradation of syriogenin to methyl 3,12-diketoetianate (II) that the second hydroxyl group is actually in the position 12, and deduced that it has the 12β orientation from NMR data(3).

We wish now to report the completely chemical proof of the structure (I) of syriogenin by partial synthesis from digoxygenin (III). Digoxygenin was transformed into the corresponding Δ^4-3-ketone (V) by oxydation to the monoketone (IV) with O_2/Pt, followed by dehydrogenation to (V) with SeO_2(4). Hydrogenation of (V) on Pd-C in CH_2Cl_2:MeOH:H_2O (7:5:1) yielded the expected(5) mixture of 5α-H-3-ketone (VI) and 5β-H-3-ketone (IV). Treatment of the mixed ketones (IV) and (VI) with $NaBH_4$ afforded a crude mixture of 3α,12β,14β-trihydroxy-5β-H-$\Delta^{20(22)}$-cardenolide (VII) and 3β,12β,14β-trihydroxy-5α-H-$\Delta^{20(22)}$-cardenolide (I)(6) which were separated by preparative TLC (eluent AcOEt-nBuOH, 9:1,v/v). The more polar compound (R_f = 0.52) was identified as 3-epidigoxygenin, whereas the less polar compound (R_f = 0.61) was identical (m.p., mixed m.p., I.R.) with syriogenin obtained by us from Dorstenia contrajerva.



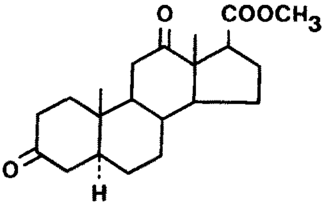
I R = $<^{OH}_{H}$; 5α H

III R = $<^{OH}_{H}$; 5β H

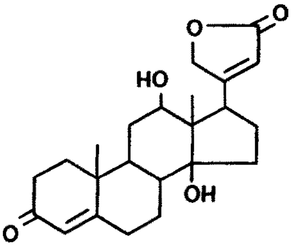
IV R = O; 5β H

VI R = O; 5α H

VII R = $<^{OH}_{H}$; 5α H



II



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6) it is well known(7) that reduction with metal hydrides yields predominantly 3α-alcohols from 5β-H-3-ketosteroids and 3β-alcohols from 5α-H-3-ketosteroids.

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