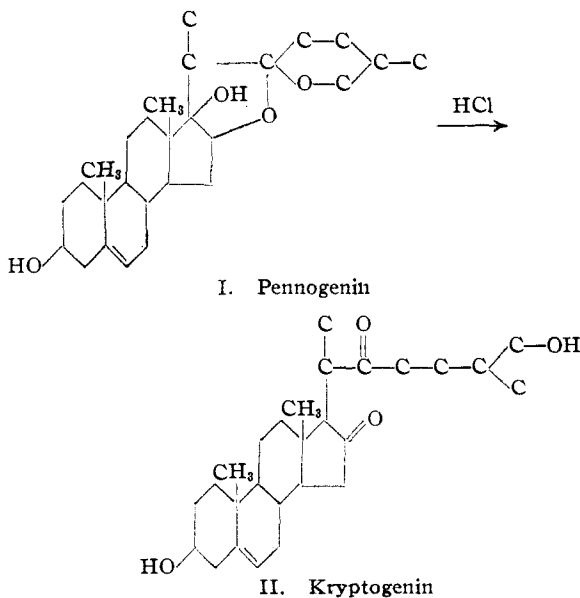


STEROLS. CLV. SAPOGENINS. LXVII. PENNOGENIN, NOLOGENIN AND FESOGENIN, THREE NEW SAPOGENINS FROM BETH ROOT

Sir:

We have investigated the steroidal sapogenin fractions from *Beth* root collected at seven different localities during the past two years. One of these lots was obtained from S. B. Penick and Company. We have found that diosgenin accounts for 35–60% of the total steroidal sapogenin fractions. From the mother liquors of the crystalline diosgenin acetate was obtained kryptogenin acetate [Marker and co-workers, *THIS JOURNAL*, **65**, 739 (1943)], m. p. 154°, in 20–40% yields. Hydrolysis of the mother liquors from kryptogenin acetate gave a new steroidal sapogenin having the composition $C_{27}H_{42}O_4$, m. p. 247°, which we have named Pennogenin. *Anal.* Calcd. for $C_{27}H_{42}O_4$: C, 75.3; H, 9.8. Found: C, 74.9; H, 10.0. The yields of the latter varied from 10–20% of the total sapogenin fractions. Two of the oxygen atoms are present as hydroxyl groups, one of which acts with boiling acetic anhydride to form a monoacetate, m. p. 200°. *Anal.* Calcd. for $C_{29}H_{44}O_5$: C, 73.7; H, 9.4. Found: C, 73.6; H, 9.6. Pennogenin shows no ultraviolet absorption for a free carbonyl group. Prolonged treatment of pennogenin (I) with ethanolic hydrochloric acid gives kryptogenin (II). We propose structure I for pennogenin.



In each of the sapogenin fractions isolated from the seven different sources of *Beth* root, the three

above products accounted for over 85% of the total crystalline sterols.

The mother liquors from pennogenin, however, contain relatively smaller amounts of two new sapogenins, m. p. 265 and 180°, which we have named nologenin and fesogenin, respectively. Both give precipitates with alcoholic digitonin and give tests for unsaturation.

Nologenin, having the composition $C_{27}H_{44}O_5$, was isolated from the crude crystalline pennogenin fraction. *Anal.* Calcd. for $C_{27}H_{44}O_5$: C, 72.3; H, 9.8. Found: C, 72.3; H, 9.5. Boiling acetic anhydride formed a diacetate, m. p. 180°. *Anal.* Calcd. for $C_{31}H_{48}O_7$: C, 70.0; H, 9.1. Found: C, 70.0; H, 9.2. Although its solubility and melting point correspond to those of chlorogenin, the two compounds are readily differentiated by their analyses and the melting points of their acetates.

Fesogenin having the composition $C_{27}H_{40}O_3$ was isolated from the mother liquor of the crude crystalline pennogenin fraction. *Anal.* Calcd. for $C_{27}H_{40}O_3$: C, 78.6; H, 9.8. Found: C, 78.3; H, 9.8. Catalytic hydrogenation using palladium-barium sulfate catalyst gave dihydrofesogenin, m. p. 213°. *Anal.* Calcd. for $C_{27}H_{42}O_3$: C, 78.2; H, 10.2. Found: C, 77.8; H, 10.2. Reduction with sodium in alcohol gave tetrahydro-fesogenin, m. p. 240°. *Anal.* Calcd. for $C_{27}H_{44}O_3$: C, 77.8; H, 10.7. Found: C, 77.6; H, 10.6. These reduction experiments indicate a conjugated system. The details of the isolation work and structure proof will be given in a forthcoming issue of *THIS JOURNAL*.

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STEROLS. CLVI. SAPOGENINS. LXVIII. THE STEROIDAL SAPOGENIN FROM *BALANITES AEGYPTICA* (WALL.)

Sir:

Kon and Weller [*J. Chem. Soc.*, 800 (1939)] have reported the isolation of a new steroidal sapogenin, nitogenin, from the kernels of *Balanites aegyptica* (Wall.). Its properties have been described as follows: m. p. 201°, $[\alpha]_D -112^\circ$ in chloroform, *Anal.* C, 77.6; H, 10.5; acetate,