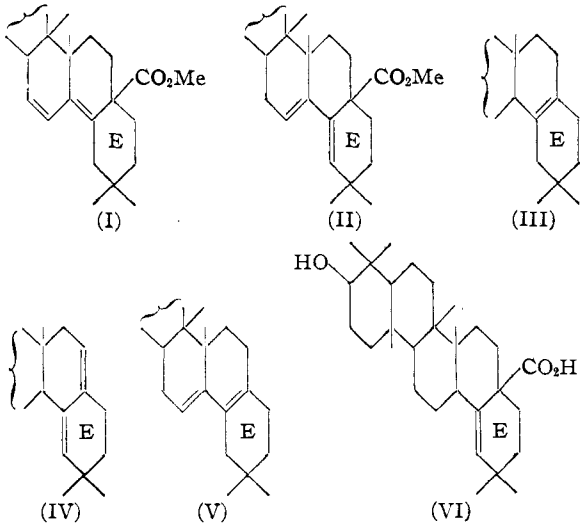
COMMUNICATIONS TO THE EDITOR

MOROLIC ACID, A TRITERPENOID SAPOGENIN

Sir:

A recent communication[1] reported the isolation from the heart-wood of *Mora excelsa* Benth. of a saponin, which furnished a crystalline sapogenin on hydrolysis. Through the courtesy of Mr. Campbell and Dr. Farmer, who kindly provided us with generous supplies of raw material, we have been able to elucidate the constitution of the sapogenin. The latter is a new triterpenoid hydroxycarboxylic acid $C_{30}H_{48}O_3$, and we propose for it the name morolic acid. Morolic acid, m. p. 273° dec. $[\alpha]_D$ +31°[2] (acetate, m. p. 256–257°, $[\alpha]_D$ +44°, equivalent 498) was converted to the acetate methyl ester, m. p. 263–264°, $[\alpha]_D$ +38°, which was reduced by lithium aluminum hydride to the corresponding glycol, $C_{30}H_{50}O_2$, m. p. 220°, $[\alpha]_D$ −11° (diacetate, m. p. 273°, $[\alpha]_D$ +23°). The latter contains one secondary and one primary hydroxyl group. By standard reactions the $-CH_2OH$ grouping was converted to $-CH_3$. In this way the known triterpenoid alcohol germanicol, $C_{30}H_{50}O$, resulted.[3]



Morolic acid acetate methyl ester readily furnished a saturated oxide (*Anal.* Calcd. for $C_{33}H_{52}O_5$: C, 74.96; H, 9.91. Found: C, 74.96; H, 9.86) which on treatment with hydrogen chloride in dry chloroform afforded dehydroöleanolic acid acetate methyl ester.[4] Oxidation of morolic acid acetate methyl ester by selenium dioxide, or fission of the oxide with ethanolic sulfuric acid, afforded the methyl ester, m. p. 188°, $[\alpha]_D$ +214°, $\lambda_{max.}$ (EtOH) 237 mμ; ε, 10,200, of a new acid. On isomerization by hydrogen chloride in chloroform the acetate methyl ester of this acid furnished the above-mentioned dehydroöleanolic acid acetate methyl ester. The latter is now to be formulated as (I), the former as (II).

On melting morolic acid was quantitatively converted to oleanol, now formulated as (III), the same easy decarboxylation to the same product being observed with *o*-oleanolic acid.[5] Reduction of morolic acid acetate methyl ester oxide by lithium aluminum hydride, followed by acetylation, gave the conjugated nor-diene acetate (IV), m. p., 220–222°, $[\alpha]_D$ −19°, $\lambda_{max.}$ (EtOH) 240 mμ; ε, 17, 100 (*Anal.* Calcd. for $C_{31}H_{48}O_2$: C, 82.06; H, 10.66. Found: C, 81.92; H, 10.78), the constitution of which has been confirmed by an unambiguous synthesis based on siaresinolic acid. (IV) was also obtained by the action of perbenzoic acid on morolic acid acetate. Isomerization afforded the nor-diene acetate (V), m. p. 189–190°, $[\alpha]_D$ +68°, $\lambda_{max.}$ (EtOH) 244 mμ; ε, 18,800, the constitution of which was proved by its formation by the facile decarboxylation of the acid corresponding to (II).

These experiments provide evidence that morolic acid has the constitution (VI).

We are indebted to Sir John Simonsen, F. R. S., and Professor E. R. H. Jones, F. R. S., for their interest in this work.

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(1) Farmer and Campbell, *Nature*, **165**, 237 (1950).

(2) M. p.'s are uncorrected; all rotations were determined in chloroform.

(3) Simpson, *J. Chem. Soc.*, 283 (1944); we are indebted to Dr. Simpson for an authentic specimen.

(4) Ruzicka, Grob and van der Sluys-Veer, *Helv. Chim. Acta*, **22**, 788 (1939).

(5) Compare Jeger, Norymberski and Ruzicka, *Helv. Chim. Acta*, **27**, 1533 (1944).

(6) Harvard University Visiting Lecturer, 1949–1950.

THE OPTICAL ROTATION OF PEPTIDES

Sir:

The optical rotation of peptides may be considered an additive function of the contributions of the asymmetric carbon atoms of the constituent amino acid residues (R).[1] The rotation of an amino acid residue, $S_1 \ldots [R] \ldots S_2$ is taken as $[\alpha] \times R/100$, where $[\alpha]$ is the specific rotation, R the residue weight, S_1 and S_2 residue substituents.[2] For dipeptides containing glycine, residue rotations are obtained by multiplying the specific rotation of the peptide with its residue weight. For other dipeptides, residue rotations are calculated by adding or subtracting the specific rotations of a pair of analogous peptides (L–L and L–D (or D–L))

(1) The first three letters of amino acids are used for R in "typical" peptides (Ala, Gly, Lys) (*cf.* E. Brand, *Ann. N. Y. Acad. Sci.*, **47**, 187 (1946)).

(2) Only the state NH_3^+,COOH is considered throughout.