

CANARIC ACID - A 3,4-SECOTRITERPENE ACID

FROM CANARIUM MUELLERI

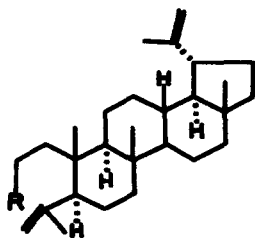
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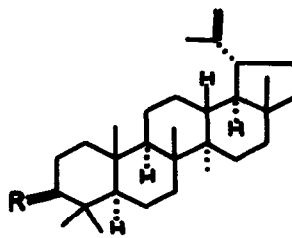
AN acid, m.p. 215-216°,  $C_{28}H_{45}(?)O_2$ , has been reported (1) to be present in the oleoresin of Canarium Muelleri. Reinvestigation now shows that this acid, which we name canaric acid, has the revised formula  $C_{30}H_{48}O_2$ , and can be assigned the 3,4-seco structure (I).



I. R - COOH

II. R - COOCH<sub>3</sub>

III. R - CN



IV. R - NOH

V. R = O

The acid, m.p. 215-216°,  $[\alpha]_D + 56.5^\circ$  (chloroform), isolated through the sparingly-soluble sodium salt, was purified by chromatography over charcoal. On hydrogenation it gave the saturated tetrahydro derivative  $C_{30}H_{52}O_2$ ,

m.p. 221° (decomp.). The methyl ester (II),  $C_{31}H_{50}O_2$ ; m.p. 119-120°;  $[\alpha]_D + 50.2^\circ$ , was readily formed from canaric acid with ethereal diazomethane.

The structure of the acid follows from a study of the infrared and proton magnetic resonance spectra, and from biosynthetic considerations. The infrared spectrum of the acid showed, besides bands associated with a carboxylic acid group, two bands at 895 and 875  $cm^{-1}$  assignable to two asymmetrically di-substituted ethylene functions. These two bands also occurred in the ester (887, 882  $cm^{-1}$ ), but disappeared on hydrogenation. The proton magnetic resonance spectrum (deuteriochloroform) showed a complex of four vinyl protons between 5.1 and 5.5  $\tau$ , two methyl groups located on double bonds (8.26, 8.31  $\tau$ ) and four additional unsplit methyl groups (8.92, 9.04, 9.15, 9.20  $\tau$ ). The tetrahydro derivative showed only eight saturated methyls between 8.95 and 9.25  $\tau$ .

The molecular formula, with only two oxygen atoms, requires that the oxygen invariably present at  $C_3$  in triterpenoids must occur in the carboxyl group of canaric acid, and therefore that the normal triterpene A ring be cleaved. The proton magnetic resonance data and the analytical figures then require canaric acid to have a tetracyclic skeleton with four unsplit saturated methyls and two vinyl methyls. The only A-seco structure derived from a naturally occurring triterpene skeleton which fulfills these requirements is the 3,4-secolupene structure (I).

The assignment of structure (I) to canaric acid was confirmed by synthesis. The oxime (IV) (2) of lupenone (V) on Beckmann rearrangement (3) with toluene sulphonyl chloride gave the 'normal' product, a lactam  $C_{30}H_{49}ON$ ; m.p. 296-298°;  $[\alpha]_D + 44.2^\circ$  (chloroform); 3155, 1665  $cm^{-1}$ , together with the 'abnormal' product, the nitrile (III);  $C_{30}H_{47}N$ ; m.p. 154-155°;  $[\alpha]_D + 53^\circ$  (chloroform); 2250  $cm^{-1}$ . Alkaline hydrolysis of the nitrile gave the acid (I)  $C_{30}H_{48}O_2$ ; m.p. 214-215° showing no mixed m.p. depression with

canaric acid;  $[\alpha]_D + 58.8^\circ$  (chloroform), giving an infrared spectrum superimposable on that from canaric acid. The methyl ester (II), m.p. 117-118 $^\circ$ ,  $[\alpha]_D + 43.8^\circ$  (chloroform), did not depress the melting point of the methyl ester of canaric acid and showed an infrared spectrum identical with that from the methyl ester of the natural product.

Canaric acid represents an addition to the small group of naturally-occurring C<sub>30</sub>O<sub>2</sub> triterpene acids (3,4), all of which have the A-seco system.

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#### References

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