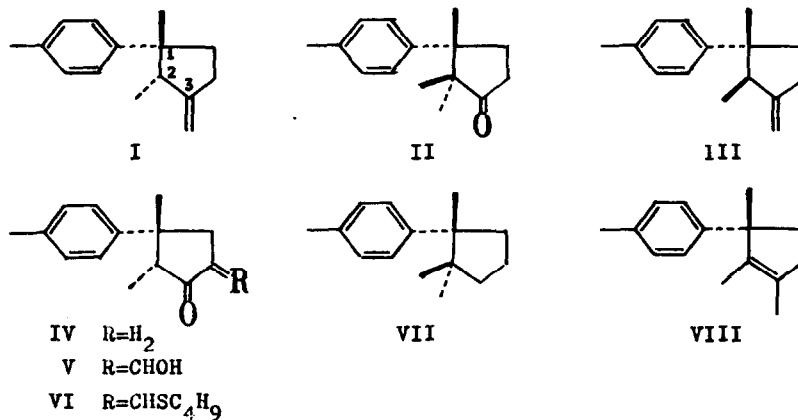


THE ABSOLUTE CONFIGURATION OF LAURENE AND α -CUPARENONE (1)

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We present herewith evidence that the absolute configuration of laurene (I) (2), a sesquiterpene hydrocarbon from Laurencia glandulifera Kützing, and α -cuparenone (II) (3) are correctly represented by formulas I and II, respectively, and also describe the synthesis of epilaurene (III), a C-2 epimer of laurene.



Ketone IV (2), $[\alpha]_D +70^\circ$ (EtOH), prepared by oxidation of I, $[\alpha]_D +48.7^\circ$, with osmium tetroxide and then with periodic acid, was treated with ethyl formate and sodium methoxide in benzene (4) to afford a hydroxymethylene compound V, which on refluxing with *n*-butyl mercaptan and *p*-toluenesulfonic acid in benzene (5) was converted into the thioether VI. Methylation of VI with methyl iodide and potassium *t*-butoxide followed by treatment with potassium

hydroxide in refluxing aqueous diethylene glycol produced a gem-dimethyl ketone, $C_{15}H_{20}O$, m.p. 52~53°, $[\alpha]_D +170^\circ$ ($CHCl_3$), the semicarbazone, m.p. 233~234°, which was identical with α -cuparenone (II) by a comparison of their optical rotations, IR and NMR spectra, and by a mixed melting point method of their semicarbazones. On the other hand, treatment of the thioetal, prepared from II and ethanedithiol, with Raney-nickel in refluxing ethanol afforded a hydrocarbon, $C_{15}H_{22}$, $[\alpha]_D +60^\circ$ ($CHCl_3$), which was identical with natural (+)-cuparene (VII) (6) in all respects. Since the absolute configuration of (+)-cuparene (7) and the relative orientation of a tolyl and a secondary methyl group in laurene (2) have been established, the present transformation completes the stereochemistry of laurene and α -cuparenone.

Next, we attempted the conversion of the ketone IV, the dl-form of which has been totally synthesized (2), into laurene. Contrary to the expectation, the attempt led to the formation of isolaurene (VIII) (2) and epilaurene (III); treatment of IV with an excess of methylenetriphenylphosphorane in DMSO at 60° (8) followed by purification of the product by column chromatography over alumina produced a new hydrocarbon designated epilaurene (III), $C_{15}H_{20}$, $[\alpha]_D -3.1^\circ$ ($CHCl_3$), in about 80% yield, and no laurene could be detected by gas chromatography (9). On the other hand, on chromatographic separation of the afore-mentioned reaction product over silica gel, III and VIII were isolated in the ratio of about 4:1. While epilaurene (III) showed almost the same IR spectrum as I, the NMR spectrum ($CDCl_3$, 60 Mc.) was different from that of I; the signal due to the secondary methyl group of I appeared at τ 9.32, whereas the corresponding peak of III at τ 9.08. Since both the hydrocarbons, I and III, were isomerized to isolaurene (VIII) under acidic conditions, epilaurene (III) should be a C-2 epimer of laurene. The above-mentioned formation of III from IV indicates that the carbon atom at position 2 has been epimerized under the reaction conditions used, although the ketone IV was recovered unchanged on treatment with sodium methoxide in refluxing methanol. It is noteworthy that the isomerization of I to VIII takes place more readily as compared with that of III.

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REFERENCES

1. Part VII of "Constituents from Marine Plants;" Part VI, N. Katsui, K. Suzuki, S. Kitamura, and T. Irie, Tetrahedron, 23, 1185 (1967).
2. T. Irie, Y. Yasunari, T. Suzuki, N. Imai, E. Kurosawa, and T. Masamune, Tetrahedron Letters, 3619 (1965).
3. G. L. Chetty and Sukh Dev, ibid., 73 (1964).
4. Cf. W. S. Johnson and H. Posvic, J. Am. Chem. Soc., 69, 1361 (1947).
5. Cf. R. Ireland and J. A. Marshall, J. Org. Chem., 27, 1615 (1962).
6. (+)-Cuparene is reported to have $[\alpha]_D +65^\circ$ in the literature (Ref. 7).
7. C. Enzell and H. Erdtman, Tetrahedron, 4, 361 (1958).
8. Cf. R. Greewald, M. Chaykovsky, and E. J. Corey, J. Org. Chem., 28, 1128 (1963).
9. Vpc analysis was done on a Hitachi KGL-2 chromatograph using PEG column at 180° .