Liverworts (Class Hepaticae) occupy an intermediate status between vascular plants and thallophytes, and they contain novel essential oil bodies in each cell of gametophytes.

*Bazzania pompeana* which was used in the present investigation is a leafy liverwort belonging to Jungermaniales and it holds 4—10 pieces of colorless oil bodies (12—13 × 7—8 μ) in each cell.

Regarding chemical constituents of other liverworts some works have been reported by HUNECK, BENESOVA and our groups.

The liverwort collected at the surburbs of Hiroshima City, after being dried in the shade, was digested with methanol. The concentrated extract was chromatographed over a silica gel column by using hexane as a solvent, and a crystaline substance was chromatographed over a silica gel column by using hexane as a solvent, and a crystaline substance and an oily substance were isolated together with the new sesquiterpenoids. These crystalline and oily substances were respectively purified by recrystallization or preparative gas-chromatography.

The crystalline substance (mp. 83—84°C) corresponds to C_{29}H_{60}O by mass spectrometry and elementary analysis. Although the compound showed absorbance due to a hydroxy group at v_{\max}^\text{IR} 1119, 1328 cm\(^{-1}\) and 

\[ \text{m/e} 1695, 155, 145, 115, 109, 91, 71, 51\] (92.1%); and ions due to \( \text{CH}_2\) cleavage at \( m/e 202 \) and a base ion at \( m/e 155 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C\(=\)O, 91.0%), and ions due to \( \beta\)-cleavage at \( m/e 171 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C\(=\)CH, 27.0%) and \( m/e 310 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C — CH\(_3\), 2.2%) of \( n\)-paraffins all over. The compound was thus deduced to be a long chain alcohol. In the oxidation with chromic acid the alcohol produced a carbonyl compound (mp. 69 — 70°C, \( m/e 422, v_{\max}^\text{IR} 1695 \) cm\(^{-1}\)). The NMR spectrum of this carbonyl compound consisted of three signals which were attributable to methylenes adjacent to the carbonyl group (\( \delta^\text{C} \) 23.8, triplet, \( J = 8.5 \) Hz), primary methyls (\( \delta 0.89, \) triplet, \( J = 5.5 \) Hz) and usual methylenes (\( \delta 1.26, \) singlet). The mass spectrum also exhibited ions due to \( \alpha\)-cleavage of the ketone at \( m/e 155 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C\(=\)O, 51.6%) and \( m/e 295 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C\(=\)O, 10.0%), and ions due to \( \beta\)-cleavage at \( m/e 171 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C — CH\(_3\), 27.0%) and \( m/e 310 \) (CH\(_5\) — (CH\(_2\))\(_8\) — C — CH\(_3\), 2.2%).

The above evidences indicate that the ketone derived by the oxidation is nonacosan-10-one, and accordingly the original alcohol is nonacosan-10-ol.

The oily substance gave a molecular ion at \( m/e 202 \) and a base ion at \( m/e 132 \) under electron impact. The compound is a benzenoid on the basis of the IR spectrum (\( v_{\max}^\text{IR} 1517 \) and 812 cm\(^{-1}\)), and the NMR spectrum exhibited the following characteristic signals: \( \delta 0.57, 1.06 \) and 1.26 (each 3H).

**Isolation of Nonacosan-10-ol and Cuparene from the Liverwort, Bazzania pompeana**

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In the course of investigation on chemical constituents of methanol extract from the liverwort, *Bazzania pompeana* (Lac.) Mitt., a secondary alcohol, nonacosan-10-ol, and a benzenoid sesquiterpene hydrocarbon, cuparene, were isolated in addition to two new sesquiterpenoids, bazzanene and bazzanenol, which have been reported.

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1 Chemical constituents from Hepaticae, Part VI; Part V, A. MATSUO, M. NAKAYAMA, and S. HAYASHI, Phytochemistry, in press.
singlet, $- \text{C}-\text{CH}_3$, 2.31 (3H, singlet, aromatic $-\text{CH}_3$), 1.35 - 1.90 (6H, complex, $-\text{CH}_2-$), 7.12 (4H, double doublet, $J = 8.5$ Hz, aromatic H).

These spectra were superimposable to those of a benzenoid sesquiterpene, cuparene.

It is the first instance that nonacosan-10-ol and cuparene were isolated from liverworts, although these compounds have been individually isolated from a few higher plants.

**Experimental**

*Isolation of nonacosan-10-ol:* The extract, after being digested with methanol and concentrated into a small volume, was chromatographed over silica gel with hexane to isolate a crystalline substance. The crystalline substance was recrystallized from hexane: mp 83 - 84°, $[\alpha]_{D}^20 = 0°$, C$_{29}$H$_{60}$O (M$^\circ$ ion m/e 424; found: C 81.84%, H 14.30%; calc.: C 81.99%, H 14.24%).

*Acetylation of nonacosan-10-ol:* The alcohol (50 mg) was acetylated by treating with acetic anhydride (0.3 ml) in pyridine (1 ml) at room temperature overnight. After addition of water (10 ml), the reaction mixture was extracted with ether (15 ml) to obtain an acetylated product as an oily substance: $\nu_{\max}^{\text{IR}}$ 1710, 1465 and 1380 cm$^{-1}$.

*Oxidation of nonacosan-10-ol into nonacosan-10-one:* Nonacosan-10-ol (35 mg) dissolved in glacial acetic acid (10 ml) was stirred with sodium dichromate (10 mg) at 80° for 10 min. The reaction mixture, after being diluted with water (20 ml), was extracted with petroleum ether (15 ml) 3 times. The petroleum solution was washed with a 5%-aqueous solution of sodium carbonate, dried over sodium sulfate and petroleum ether distilled out to obtain a crystalline substance: mp. 69 - 70°, $\nu_{\max}^{\text{Nujol}}$ 1710, 1465 and 1380 cm$^{-1}$.

*Isolation of cuparene:* The oily substance separated by the above elution chromatography of the extract was successively subjected to preparative gas-chromatography. An oily substance was thus isolated in a pure state with respect to gas chromatography (PEG 6000 and DEGS) and thin-layer chromatography (silica gel and hexane): C$_{15}$H$_{22}$ m/e 41 (31%), 55 (15%), 91 (23%), (10%), 187 (3%) and 202 (M$^\circ$, 17%).

**Das Bürzeldrüsensekret des Eissturmvogels**

(Fulmarus glacialis)

Uropygial Gland Fat of the Fulmar

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The uropygial (preen) gland fat of the fulmar (Fulmarus glacialis) was shown to be a complex mixture of ester waxes. Acidic components were homologous series of 3-, 4- and 6-monomethyl-substituted, and 2,6-, as well as 3,7-dimethyl-substituted fatty acids. Besides, 2-methyl, 2,4-, 4,6-, and 4,8-dimethyl-substituted fatty acids could be detected.

The alcoholic components belonged to homologous series of n-alkanols, and 2-, 4-, and 6-methyl-substituted primary alkanols. Furthermore, 14-methyl-hexadecanol could be identified.