Occurrence of 1,2-Dihydro-carotenoids in *Rhodopseudomonas viridis*

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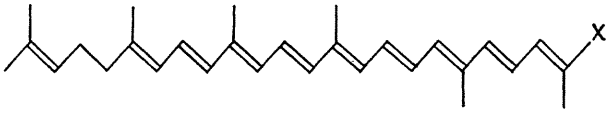
Summary Three carotenoids, isolated from *Rhodopseudomonas viridis* have been identified as 1,2-dihydroneurosporene, 1,2-dihydrolycopene, and 1,2-dihydro-3,4-dehydrolycopene.

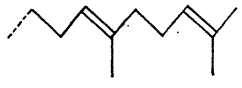
THE carotenoid pigments of the non-sulphur photosynthetic bacteria (*Athiorhodaceae*) have been widely studied, and are almost always acyclic compounds, which may have tertiary hydroxy- and methoxy-substituents at C-1 and C-1'.[1] We now report that the major carotene hydrocarbons of one species, *Rhodopseudomonas viridis*, are not, as previously supposed,[2] neurosporene (Ia) and lycopene (Ib), but are closely related compounds with the novel 1,2-dihydro end-group.

Investigation of the hydrocarbon fraction from *Rhodopseudomonas viridis*, strain NTHC 133, grown anaerobically in the light, revealed the presence of five carotenoids. Two of these, which were present in small quantities, were identified as neurosporene and lycopene. The two major pigments could be separated from neurosporene and lycopene, respectively, only by repeated t.l.c. on Silica gel G, and had visible spectra identical to those of neurosporene and lycopene, with λ_{max} (light petroleum) at 414, 439, and 468 nm, and 444, 470, and 502 nm respectively. The mass spectra, (A.E.I. MS12) however, showed the presence, in each case, of two extra hydrogen atoms (M = 540 and 538 respectively, corresponding to $C_{40}H_{60}$ and $C_{40}H_{58}$). Major fragment ions were observed at m/e 471 ($M-69$) and 401 ($M-139$) for the neurosporene-like compound, and at m/e 469 ($M-69$) and 467 (weaker, $M-71$) for the lycopene-like compound. These fragmentations were supported by the presence of fragment-ions produced by multiple losses, and by the presence of the appropriate metastable ions.

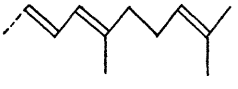
The mass spectra thus suggested the structures 1,2-dihydroneurosporene (Ic) and 1,2-dihydrolycopene (Id), respectively. These structures were confirmed by their n.m.r. spectra, a feature of which was a six-proton doublet (J 6 Hz) at τ 9·12, due to the methyl groups of the isopropyl end-group.



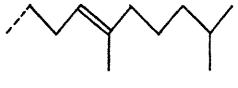
Ia, X =



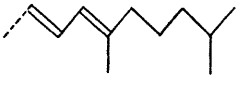
Ib, X =



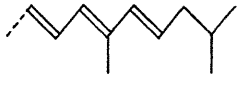
Ic, X =



Id, X =



Ie, X =



The fifth compound, isolated in small amount, was a hydrocarbon with λ_{max} (light petroleum) at 457, 483, and 518 nm, characteristic of a 12-conjugated-double-bond

chromophore. The mass spectrum, (*M* 536; $C_{40}H_{56}$) was consistent with structure (Ie) (1,2-dihydro-3,4-dehydrolycopene).

These compounds are the first carotenoids to be reported which have the 1,2-dihydro end-group, which is presumably formed biosynthetically by reduction of the C-1,2 double bond normally present in the acyclic carotene hydrocarbons.

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[1] S. L. Jensen, "Bacterial Photosynthesis," ed. H. Gest, A. San Pietro, and L. P. Vernon, Antioch Press, Ohio, 1963, p. 19.
[2] H. Eimhjellen, personal communication, quoted by J. P. Thornber, J. M. Olson, D. M. Williams, and M. L. Clayton, *Biochim. Biophys. Acta*, 1969, **172**, 351.