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Bacterial Carotenoids XIII *

On the Constitution of the Minor Carotenoids of *Rhodopseudomonas*

4. 2-Keto-rhodovibrin

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In the kinetic experiments carried out in collaboration with K. E. Eimhjellen¹ in order to elucidate the route of carotenoid biosynthesis in *Rhodopseudomonas gelatin-*

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osa, a new carotenoid was isolated in minute amounts (3 μ g). This carotenoid accumulated in washed suspensions of anaerobically grown cells when incubated in light with heavy aeration.

The new pigment was obtained in a paper-chromatographically² pure state. Absorption spectra in visible light were recorded in various solvents, and the maxima are presented in Table 1, together with those of the two keto-carotenoids OH-spheroidenone (OH-R) (I)³ and P518 (2-keto-spirilloxanthin) (II)⁴. The shapes of the absorption spectra for these three compounds were very similar in the solvents investigated. The moderate fine-structure of the spectrum recorded in petroleum ether, compared with the round-shaped spectrum in ethanol^{3,4}, was strongly indicative of the presence of a conjugated keto-group also in the new carotenoid.

Table 2. Adsorptive properties on Schleicher and Schüll No. 287 paper of some *trans* carotenoids determined by co-chromatography (10 % acetone-petroleum ether).

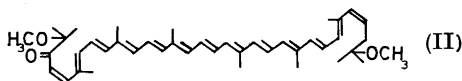
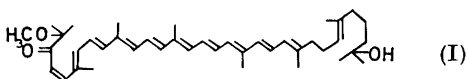
Carotenoid	Colour of the zone	R _F -values
OH-Spheroidenone ³	red	0.73
P518 ⁴	violet	0.45
New Pigment	red-violet	0.25

Table 1. Absorption maxima in $m\mu$ in visible light of various carotenoids.

Carotenoid	Abs.max. in $m\mu$ in						Chromophore consisting of number of conjugated	
	Petroleum ether			Acetone		Ethanol	double bonds	keto groups
OH-Spheroidenone ³	460	483	516	484 (505)		487	10	1
New Pigment	485	511	544	485 512 (540)		520	12	1
P518 ⁴	487.5	518	555	495 528 599		522	13	1

Table 3. Partition ratios in petroleum ether/95 % methanol for some carotenoids.

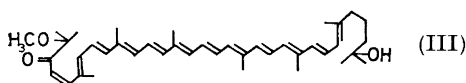
Carotenoid	Partition ratio ⁶	Number of functional groups		
		conjugated double bonds	conjugated keto groups	hydroxyl groups
P518 ⁴	82:18	13	1	0
OH-Spheroidenone ³	63:37	10	1	1
Rhodovibrin ⁵	66:34	12	0	1
New pigment	ca. 4:6	12	1	1



The new carotenoid was more strongly adsorbed on kieselguhrpaper than any of the stereoisomers of OH-spheroidenone (I) and P518 (II), and the R_F -values of these three pigments were very different, as shown in Table 2.

In the partition test between petroleum ether and 95 % methanol (carried out in a qualitative manner due to shortage of material), the pigment was markedly hypophasic. It must therefore contain a hydroxyl group, as can be seen from the data presented in Table 3.

The properties reported above for the new pigment are compatible with its structure as a 2-keto-rhodovibrin (III); the latter is a missing intermediate in the biosynthetic conversion of OH-spheroidenone (I) to P518 (II) ¹.



The spectroscopic similarity of the new pigment with the carotenoid P512 described by Goodwin ⁷ is obvious, and the structure now suggested for the new carotenoid is in fact seen to be identical with one of the alternative structures suggested by us ⁸ for P512, based on the data reported by Goodwin ⁷. However, judging by the adsorptive properties of the new compound and its minor occurrence relative to that of P518 (approximate ratio 1:10) in aerated cultures of *Rhodospseudomonas gelatinosa*, there can be no doubt that the carotenoid described here is not identical with P512 ⁷, which has lately been assumed to represent an impure form of P518 (II) ¹.

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