Cohen-Bazire, Nakayama & Stanier (1958) were examined. The former has been shown, on the basis of its absorption spectrum, chromatographic behaviour and mass spectrum, to be identical with a sample of spheroidene isolated from an anaerobic culture of *Rhodospseudomonas spheroides*. The second has a chromophore of eight conjugated double bonds and bears the same chromatographic relationship to spheroidene as spheroidene does to anhydrorhodovibrin. The mass spectrum of this new carotenoid shows that it is 11',12'-dihydro-spheroidene.

These two carotenoids must be formed in *R. rubrum* by sequences of consecutive reactions, analogous to that used in the formation of anhydrorhodovibrin from lycopene, but operating at a different level in the dehydrogenation sequence described by Davies & Holmes (1969). Thus 7,8,11,12-tetrahydrolycopene is converted into 11',12'-dihydrospheroidene and spheroidene is formed, as in *Rps. spheroides* (Jensen *et al.*, 1961) from neurosporene. Eimhjellen & Jensen (1964) showed that spheroidene is dehydrogenated to anhydrorhodovibrin in *Rhodospseudomonas gelatinosa*; this same reaction, together with the analogous conversion of 11',12'-dihydrospheroidene into spheroidene, probably occurs in *R. rubrum*.

In addition, the existence in diphenylamine-inhibited cultures of *R. rubrum* of a carotenoid with the chromatographic behaviour (before and after silylation) and absorption spectrum of hydroxy-spheroidene indicates that spheroidene may also act as a precursor of spirilloxanthin in a pathway that does not involve anhydrorhodovibrin; such a pathway has been established in *Rps. gelatinosa* (Eimhjellen & Jensen, 1964).

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On the Presence of Plastochromanols in Plants

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The green tissue of plants is known to contain several chromanols including α -, β -, γ - and δ -tocopherols as well as plastochromanol-8, a cyclic relative of plastoquinone-9 (Dunphy, Whittle & Pennock, 1966). This communication reports on a number of chromanols apparently related to the plastoquinones PQB, PQC and PQZ. Following the characterization of plastoquinone-9 (PQA) Kegel, Henninger & Crane (1962) described two other plastoquinones, PQB and PQC, and recently another member of the family, PQZ, has been recognized (Wallwork & Pennock, 1968). It was later realized that the PQB and PQC groups were mixtures and not single components (Griffiths, Wallwork & Pennock, 1966) and Griffiths (1966) showed that PQB species contained an ester group in the side chain. It was suggested that two types of PQC could occur, one with a secondary hydroxyl group:

and the other with a tertiary hydroxyl group:

(Wallwork & Pennock, 1968). Perhaps eight compounds of each type occurred, and the PQB species were thought to be esters of the secondary type. PQZ species had the characteristics of both ester and hydroxyl compounds.

Investigation of lipids from *Lingustrum* and *Polygonum* yielded three groups of chromatographically distinguishable chromanols which all gave a blue-grey colour with diazotized *o*-dianisidine, characteristic of a 7,8-dimethylchromanol. The u.v. and i.r. spectra were similar to those of plastochromanol-8 and from the other physicochemical properties it was clear that these compounds were plastochromanols related to PQB, PQC and PQZ species. In particular the plastochromanol B species showed evidence of the group:

and plastochromanol C appeared to contain the group:

The content of plastochromanols in several leaves was determined.

These new chromanols were isolated in relatively high amounts from autumnal leaves, being present at concentrations comparable to the related plastoquinones. Whether these chromanols appear predominantly in the autumn or will be found throughout the summer remains to be seen. Hypothetical schemes for chromanols as metabolic intermediates have been devised (see Lederer & Vilkas, 1966), but none have proved fully acceptable. It appears that a sequence of reactions can befall plastoquinone, probably commencing with epoxidation and isomerization and followed by cyclization or esterification or both, and indeed further epoxidation and isomerization may occur.

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The Role of Malonyl-Coenzyme A in Isoprenoid Biosynthesis

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The route for the formation of the acetoacetyl moiety required for the synthesis of β -hydroxy- β -methylglutaryl-CoA (HMG-CoA) is still in doubt. Whereas Brodie, Wasson & Porter (1962, 1963, 1964) reported the formation of HMG-CoA and mevalonic acid by a pigeon liver fatty acid synthetase preparation, and Ishikara, Koyama & Takeda (1965) produced evidence for the formation of sterols from malonyl-CoA by dispersed rat liver cells, Fimognari & Rodwell (1964) and Fimognari (1965) concluded that in rat liver the proportion of mevalonic acid formed from malonyl-CoA was relatively small.

Further evidence concerning the role of malonyl-CoA in isoprenoid biosynthesis was sought by measuring the relative incorporation of [1,3-¹⁴C]- and [2-¹⁴C]-malonyl-CoA into squalene, crystallized as the hexahydrochloride. The 12000g supernatant from a cell-free extract of baker's yeast incorporated [2-¹⁴C]acetate and [1-¹⁴C]acetate in the ratio 3.0:2.0, whereas the ratio from [2-¹⁴C]- and [1,3-¹⁴C₂]-malonyl-CoA, in the presence of unlabelled acetyl-CoA, was 9.2:0.1. Analogous experiments, with a rat liver preparation (Knauss, Porter & Wasson, 1959), gave similar relative incorporation of [2-¹⁴C]- and [1-¹⁴C]-acetate but showed that [2-¹⁴C]- and [1,3-¹⁴C₂]-malonyl-CoA were incorporated in the ratio 1.31:1.0. These results indicate utilization on malonyl-CoA for squalene synthesis, but interpretation in terms of utilization of malonyl-CoA itself or prior decarboxylation to acetyl-CoA is difficult.

The latex of *Hevea brasiliensis* incorporated [2-¹⁴C]malonyl-CoA into fatty acids, but neither the non-saponifiable lipid nor the rubber was labelled. When, however, the latex was fortified by the addition of NADPH (0.3-0.5 μ mole/ml.), radioactive rubber was formed and, in contrast with the unfortified system, labelled mevalonic acid was detected when an unlabelled trapping pool was added.

We were unable to detect the formation of labelled mevalonic acid or labelled HMG from [2-¹⁴C]malonyl-CoA by a highly purified (Hsu, Wasson & Porter, 1965) pigeon liver fatty acid synthetase. The enzyme incorporated the substrate satisfactorily into palmitate, and formed a labelled material chromatographing at the same R_F as 3,5-dioxohexanoic acid.

Experiments are in progress to study the incorporation of malonyl-CoA into isoprenoids in conditions where the formation of malonyl-CoA itself is inhibited.

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