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SHORT COMMUNICATION

# PLASTOQUINONE-8 IN LEAVES OF *AESCULUS HIPPOCASTANUM*

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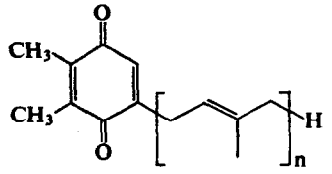
A NEW naturally occurring plastoquinone has been isolated from the leaves of *Aesculus hippocastanum* (Hippocastanaceae); this has been shown, on the basis of its u.v. spectral, mass spectral and TLC properties (see below), to be 2,3-dimethyl-5-octaprenyl-1,4-benzoquinone (plastoquinone-8) (I, where $n = 8$).



(I)

The occurrence of plastoquinone-8 in nature is not confined to *A. hippocastanum* since we have also detected it in shoots of *Zea mays* seedlings, leaves of *Ficus elastica* and photosynthetically grown cells of *Euglena gracilis* strain Z. In view of these findings it is reasonable to suppose that this quinone is present in most if not all photosynthetic plant species.

## EXPERIMENTAL

### *Isolation of Plastoquinone*-8

Lipid (6 g, extracted by our routine procedure[1]) from leaves of *Aesculus hippocastanum* (equivalent to 53 g dry wt.; collected locally in July 1969) was chromatographed on a column of Brockmann grade III acid-washed alumina (100 g) developed with 15% diethyl ether in light petroleum (b.p. 50–60°). The lipid (1·2 g) in the 15% diethyl ether light petroleum fraction was then chromatographed on a second column of Brockmann grade III acid-washed alumina (100 g) developed by stepwise elution with 0·25% and 1% diethyl ether in light petroleum (b.p. 40–60°).

The 1% diethyl ether–light petroleum fraction was chromatographed on thin-layers of Kieselgel G (impregnated with Rhodamine 6G) using benzene–light petroleum (b.p. 40–60°) (2:3, v/v) as developing solvent. The plastoquinone complex, visible under u.v. light as a purple band ($R_f$ 0·3), was removed and then chromatographed on thin layers of Kieselgel G impregnated with paraffin, using aq. 95% (v/v) acetone as developing solvent. This procedure gave 53 mg of plastoquinone-9 (I, where $n = 9$) ($R_f$ 0·3), the major plastoquinone found in plant tissues and 0·52 mg of plastoquinone-8 ($R_f$ 0.38). Finally, to remove paraffin, the plastoquinone-8 was chromatographed on a thin layer of Kieselgel G using benzene–light petroleum (b.p. 40–60°) as developing solvent.

### *Characterization of Plastoquinone*-8

The identity of this quinone was established by: 1. TLC (adsorptive, reversed-phase and silver ion); 2. u.v. spectroscopy ($\lambda\lambda_{max}$ 254 and 261 nm in cyclohexane; $\lambda_{max}$ 255 nm in ethanol, changing to 291 nm after treatment with $NaBH_4$); 3. mass spectrometry [$m/e = 682$ (M + 2; due to a dismutation reaction in the

[1] W. T. GRIFFITHS, D. R. THRELFALL and T. W. GOODWIN, *Biochem. J.* **103**, 589 (1967).

spectrometer resulting in the formation of the ion corresponding to the hydroquinone[2]), 680 (M) and 189 (base peak) (the latter is observed in all plastoquinone spectra and proves the quinone contains the same 2,3-dimethyl-5-monoprenyl-1,4-benzoquinone unit, or an isomer of it[2])]; 4. the fact that its perhydrochromanol [prepared by cyclization in pyridine followed by catalytic (Adams catalyst) reduction with $H_2$] had staining properties with dianasidine identical to those of a 7,8-dimethyl chromanol (compare with 5,8- and 5,7-dimethyl chromanols).[3]

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[2] B. C. DAS, M. LOUNASMAA, C. TENDILE and E. LEDERER, *Biochem. Biophys. Res. Commun.* **21**, 318 (1965).
[3] G. R. WHISTANCE and D. R. THRELFALL, *Phytochem.* **9**, 213 (1970).