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THE CAROTENOID PATTERN IN *IRIS GERMANICA**

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Key Word Index—*Iris germanica*; Iridaceae; carotenoids; irones.

The rhizomes of different *Iris* species (*pallida*, *fiorentina*, *germanica*) synthesize considerable quantities of irones [1-4]. Since it is assumed that several naturally occurring 1,1,5-trimethylcyclohexyl derivatives are metabolic products of carotenoids [5,6], the occurrence of irone-like (2-methylated) carotenoids in irone producing plants might be expected. Both optically inactive [7] and active (2R,2'R)-2,2'-dimethyl- β,β -carotene [8], (2R,2'R, 6R,6'R)-2,2'-dimethyl- ϵ,ϵ -carotene [9] and (2R,2'R, 6S,6'S)-2,2'-dimethyl- ϵ,ϵ -carotene [9] have been prepared synthetically, but no 2-methylated carotenoids have so far been found in nature. However, C₄₅- and C₅₀-carotenoids with isopentenyl substituents in 2,(2')-positions occur in certain non-photosynthetic bacteria [10,11].

The grey-coloured roots of *Iris germanica* contain hardly any carotenoids. In the present work

the following distribution pattern was found in the green parts of the plant:

| | |
|--------------------------------------|-----------------|
| β -carotene | 7.1% (4.3 mg) |
| lutein | 87.8% (53.2 mg) |
| neochrome (neoxanthin furanoxide) | 3.5% (2.1 mg) |
| 7 minor constituents | 1.6% (1.0 mg) |

Neochrome was isolated as a mixture of the two C-8' epimers and is therefore considered an artefact, formed by rearrangement of neoxanthin during isolation.

The result demonstrates that the carotenoids present correspond to those occurring in most green plants. The carotene-xanthophyll ratio is consistent with autumn values reported for green leaves by Willstätter and Stoll [12].

Presence of supernumerary methyl groups in the carotenoids isolated was excluded by mass spectrometry. It may consequently be inferred that irones are not likely to be formed by degradation of 2-methylated carotenoids.

* Part VIII in the series "Carotenoids of higher plants". For Part VII see (1974) *Acta Chem. Scand.* **28B**, 13.

EXPERIMENTAL

Materials and methods were as usually employed in this laboratory and are summarized elsewhere [13].

Isolation. 1380 g Fresh leaves were collected in Zürich (Sept. 1973), extracted in a Waring blender with Me_2CO -MeOH (1:1) and the residue on evaporation saponified with 10% methanolic KOH.

Separation of the crude carotenoids (67.4 mg, $E(1\%, 1\text{ cm}) = 2500$) into carotenes and xanthophylls was effected by an alumina (act. grade 1) column with C_6H_6 . Further separation of the xanthophylls on a Si gel column with 10-40% Me_2CO in light petrol. (40-60°) gave two weak zones followed by lutein and then neochrome. Lutein (53.2 mg) was crystallized from C_6H_{10} /light petrol. The final purification of the other pigments was carried out on preparative plates using alumina and 3% ether in light petrol. for β -carotene (4.3 mg); kieselgel and 25% Me_2CO in light petrol. for neochrome (2.1 mg).

Identifications were made on the basis of co-chromatography with authentic samples, visible spectra and MS. For neochrome (two zones with identical visible spectra on TLC and kieselguhr paper), also IR (allenic abs.), acetylation (to diacetates) and silylation (of diacetate to diacetate monotrimethylsilyl ether) were employed. Authentic C-8' epimeric neochrome was prepared by acid rearrangement of neoxanthin.

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