P16

Dynamic Changes of Photosynthetic Pigments in Soybean Callus Culture under High Light Intensity

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Objectives

We have worked on the dynamic changes of various photosynthetic pigments and their behavioral patterns with increasing duration of a high light intensity (3000 μE $m^{-2}s^{-1}$) in *in vitro* green calli of soybean.

Materials and Methods

1. Materials: The hypocotyl segments from 5 days-soybean seedling were used for the callus induction. After 30 days of culture on a solid MS medium (pH 5.8) supplemented with 4.52 μM 2,4-D and 2.32 μM kinetin and 3% sucrose and 1.1% agar, the green calli were illuminated with a high light intensity (3000 μE $m^{-2}s^{-1}$) for 0, 3.5 and 24 h to investigate the zeaxanthin induction.
2. Methods: Spectrophotometry and HPLC with a Waters 486 tunable absorbance detector.

Results and Discussion

Dynamic changes of photosynthetic pigments such as neoxanthin, violaxanthin, anteraxanthin, zeaxanthin, Chl *a*, Chl *b*, α-carotene, β-carotene and their behavioral patterns of photoinhibition with increasing duration of the high light intensity were investigated in the soybean callus cultures. As measured by either a spectrophotometer or a HPLC, the contents of total carotenoids increased, while the ratio of total Chl/total carotenoids decreased with increasing duration (3.5 h) of the high light intensity (Figure 1). This interconversion of violaxanthin into zeaxanthin reveals that zeaxanthin in the xanthophyll cycle plays a significant role in the prevention from the photoinactivation of the PSII reaction center. Therefore, the effects of the high light intensity on the kinetics of violaxanthin de-epoxidase in the xanthophyll cycle in the soybean callus cultures are under investigation.

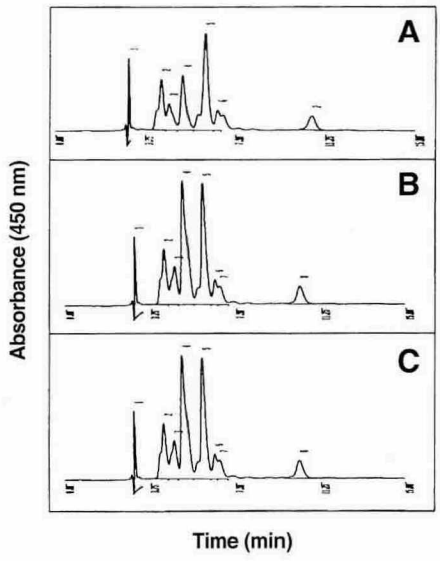

Figure 1. HPLC profiles for photosynthetic pigments of soybean callus under high light intensity (3000 μE $m^{-2}s^{-1}$) for 0 h (A), 3.5 h (B) and 24 h (C). Using a mobile phase (acetonitrile: methanol: water: ethyl acetate; 7: 0.96: 0.04: 2, v/v), the separations was carried out for 15 min on a C_{18} columns with flow rate of 1.0 cm^3 min^{-1}. Detection was done at 450 nm. (1) neoxanthin, (2) violaxanthin, (3) anteraxanthin (4) zeaxanthin (5) Chl *a*, (6) Chl *b*, (7) α-carotene and (8) β-carotene.

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