

# Physiological Significance of Overproduced Carotenoids in Transformants of the Cyanobacterium *Synechococcus* PCC7942

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The functional location of carotenoids in the photosynthetic apparatus of *-crtB* and *-pys* transformants of the cyanobacterium *Synechococcus* PCC7942 was studied and compared with a control strain *-pFPI-3*. These transformants overproduce carotenoids due to the insertion of an additional foreign phytoene synthase gene. A higher carotenoid content was found for *-crtB* and *-pys* transformants both in whole cells and isolated membranes; the *-crtB* transformant was also enriched with chlorophyll. 77-K fluorescence emission and excitation spectra of the phycobilin-free membranes were examined for a possible location of overproduced carotenoids in pigment-protein complexes *in situ*. A similar ratio of the amplitudes of fluorescence bands at 716 and 695 nm emitted by photosystems I and II, found for the three strains, indicates that the stoichiometry between photosystems of the transformants was not changed. Overproduced carotenoids are not located in the core antenna of photosystem I, since 77-K fluorescence excitation spectra for photosystem I of isolated membranes from the studied strains do not differ in the region of carotenoid absorption. When illuminated with light of the same intensity but different quality, absorbed preferentially by either carotenoids, chlorophylls or phycobilins, respectively, oxygen evolution was found always higher in the transformants *-crtB* and *-pys* than in *-pFPI-3* control cells. Identical kinetics of fluorescence induction of all strains under carotenoid excitation did not reveal a higher activity of photosystem II in cells enriched with carotenoids. It is suggested that overproduced carotenoids of the transformants are not involved in photosynthetic light-harvesting; rather they may serve to protect the cells and its membranes against photodestruction.

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