PHOTOINHIBITION OF PHOTOSYNTHESIS

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Photoinhibition of photosynthesis is a widespread phenomenon in oxygenic photosynthetic organisms that can result in large decrease in photosynthetic productivity. In the broad context, photoinhibition of photosynthesis can be defined as the light-induced decrease in CO_2 assimilation which includes the effects of photo-oxidative radical damage to many components of the photosynthetic apparatus under high irradiances. However, photoinhibition of photosynthesis is often used to refer specifically to light-induced damage to the PSII reaction center, which precedes the onset of more severe radical-induced damage to other components of the photosynthetic apparatus.

Photoinhibition of the PSII reaction center can occur by two independent mechanism, each associated with the acceptor or donor side of PSII. Both result in the inhibition of electron transfer through PSII and subsequent degradation of the D1 protein. Photodamage to D1 is thought to occur in the granal region of the thylakoids, where the bulk of the PSII is located. However, synthesis of D1 precursor protein is primarily associated with polysomes located in the stromal thylakoids. It has been speculated that photoinactivated PSII complexes migrate from appressed to non-appressed membrane regions, where insertion of newly synthesized D1 into partially assembled PSII complexes occurs, resulting in the repair of the damaged PSII complexes; then repaired PSII complexes migrate back to appressed membrane regions.