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Maize bundle sheath chloroplasts- a unique model of permanent State 2

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Highlights

- Agranal bundle sheath chloroplasts of maize are in-permanent State 2.
- The classic state transitions are in mesophyll, but not in bundle sheath chloroplasts.
- The light quality controls this process in mesophyll, but not in bundle sheath chloroplasts.

Abstract

The effect of high intensity of far red (FR) light on the energy distribution between PSII and PSI, measured as a change in the fluorescence emission in mesophyll (M) and bundle sheath (BS) chloroplasts of *Zea mays* was investigated in this paper. In bundle sheath thylakoids, FR light (730 nm) significantly stimulates 77K fluorescence of PSII but does not change the PSI fluorescence. In mesophyll thylakoids, the FR light used after the white light increased and decreased the PSII and PSI fluorescence, respectively. This indicates that in M chloroplasts light quality controls photosynthetic state transitions. The blue native (BN) PAGE, followed by SDS PAGE demonstrated that LHCII proteins associated with PSI were phosphorylated in the BS thylakoids in FR light. In M chloroplasts FR-light induced dephosphorylation of LHCII and the detachment of antenna from PSI occurred. In the BS thylakoids, the FR light initiated dephosphorylation of free and aggregated LHCII antenna, the dephosphorylated antenna can bound to PSII, thereby strongly increase its fluorescence, while part of LHCII pool stays associated with PSI. Thus aggregates of LHCII tended to be resolubilized in FR light and this allowed LHCII to connect to PSII, without changes in the pool of PSI-LHCI-LHCII. Our data indicate that PSI is locked in State 2 in agranal bundle sheath chloroplasts of maize. These results allow us to better understand the complexity of regulatory mechanisms of state transitions activated in response to light changes in M and BS chloroplasts of maize.