Spectroscopic Studies of the IsiA-Photosystem I protein supercomplexes from the filamentous cyanobacterium *Anabaena* sp. PCC 7120

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Cyanobacteria, if exposed to iron-deficient conditions prevalent in nature, express large quantities of Iron-stress-induced-A proteins (IsiA). In the model cyanobacterium *Synechocystis* 6803, IsiA protein is highly homologous to CP43 inner antenna protein of PSII. Typically, IsiA forms tight rings around PSI trimer, forming new PSI-IsiA supercomplexes, though it could also produce PSI-free ring-like assemblies. However, some cyanobacteria, such as *Anabaena* 7120, produce multiple different versions of IsiA, which are structurally distinct from the IsiA seen in *Synechocystis* 6803 and interact differently with PSI. The photophysical properties and functional roles of such supercomplexes have not been investigated in detail.

Here, we present a set of spectroscopic studies on two distinctly different PSI-IsiA supercomplexes from *Anabaena* sp. PCC 7120. The investigations focused on determination of how alterative assemblies of PSI and IsiA influence the process of excitation energy transfer between antennas and core complex. For that purpose, we employed a broad range of static and time-resolved optical spectroscopies such as absorption, fluorescence, fs-time-resolved transient absorption, and ps-time-resolved fluorescence decay mapping. The studies were performed at 77 K. Low temperature enhances spectral differences between both separations, but also greatly improves detectability of some signals (as PSI-mediated fluorescence emission), which are extremely low and difficult to evaluate at room temperature. Additionally, we employed a unique sample handling method. All measurements were done on samples obtained via clear native gel separation (gel cuts with bands, B1 and B2).

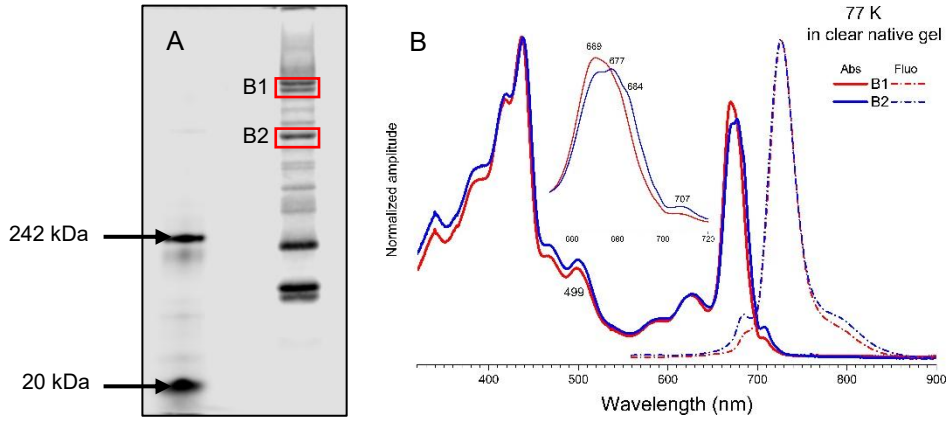

Figure 1. A) Clear-Native PAGE showing the pigment-protein bands B1 and B2. **B)** Absorption and fluorescence emission spectra of two species of IsiA-PSI supercomplexes (B1, B2) in polyacrylamide gel. The spectra were recorded at 77 K. For better comparability all spectra were normalized at their maxima.

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