Chromatic Adaptation of the Red Alga *Galdieria yellowstonensis*

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Galdieria yellowstonensis is an extremophilic red alga which has a broad range of pigments of both cyanobacterial (phycobilins and phycobiliproteins) and eukaryotic (chlorophyll-based) origin. This alga is thus capable of adjusting its light-harvesting apparatus to the wavelengths available through chromatic adaptation and modulation of pigment usage and expression. Chromatic adaptation was induced in *G. yellowstonensis* to determine differences in exciton and electron usage driving the light reactions under specific light regimes. *G. yellowstonensis* cultures were grown under white, red, and blue light at 30°C and investigated for their pigment expression and distribution and electron transfer kinetics. Under blue light, an electrochromic shift three times stronger than in either of the other cultures was observed, as well as sixfold stronger oxidation at Photosystem I than under red light. While all three cultures showed similar redox poise of plastocyanin, cytochromes b and f of the b_6f complex were about half as oxidized in response to light when adapted to either red or blue light. Red light prompted a threefold decrease in active Q_B sites of photosystem II but despite this limitation, electron flux to cytochrome b_6f and photosystem I remained high and appeared to be primarily linear. Under blue light, *G. yellowstonensis* appears to undergo strong cyclic electron flow around photosystem I which dominates the activity of the electron transport chain and generates a strong trans-thylakoid proton gradient. Despite this, the remaining, diminished, photosystem II population remains highly efficient in electron removal.