

# Thermoregulation of the trophic modes of *Galdieria yellowstonensis*

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*Galdieria yellowstonensis* (strain YNP 5572) is an extremophilic red alga capable of switching between autotrophic and heterotrophic modes of growth. This study aimed to investigate the regulation of trophic switching in response to thermal conditions. *Galdieria yellowstonensis* was exposed to temperatures of 30°C and 42°C under conditions with glucose (+G) and without glucose (-G) in a diurnal cycle. In the absence of glucose, notably, more PSI and PSII are present regardless of temperature. +G at 30°C produces a diurnal cycle of PSI and PSII activity, and under other conditions, this is relatively constant. In the absence of glucose, more phycobilin is expressed and more of it is associated with the photosystems, suggesting enhanced light capture and charge separation, whereas +G cultures at both temperatures expressed less phycobilin. Fast repetition rate fluorometry was used to assess PSII-WOC activity. The -G cultures exhibited prominent oscillations, whereas +G cultures at both temperatures displayed no oscillations and, thus, no activity. Oscillation quality was higher at the higher temperature. In -G cultures, at 30°C a lower Q-factor of 2.26 was observed, while at 42°C a higher Q-factor of 2.70 was seen. -G has similar PSI activity observed at both temperatures. In contrast, +G cultures at 42°C show more PSI oxidation than at 30°C, implying that PSI reoxidation depends on temperature when sugar is present.