O2k brief Photosynthesis
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High-resolution respirometry and photocalorimetry

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Thermochimica Acta 446:11-19 (2006)

Oxygen polarographic measurements combined with photocalorimetry as a tool to study light emissions as fluorescence and thermal dissipation

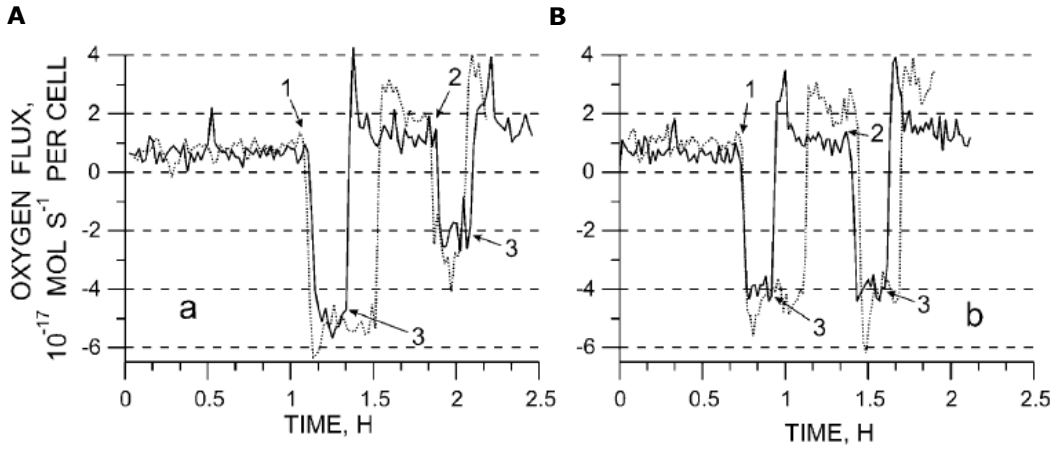

Figure 1. Oxygen consumption of *Dunaliella maritima* in dark and light. **A)** control and **B)** salt stressed cells. The arrows indicate the time points of (1) switching the light at 90 µmol photons m^{-2} s^{-1}, (2) 50 µmol photons m^{-2} s^{-1} and (3) switching off the light. These measurements were carried out in four separate experiments (only representative traces are shown here).

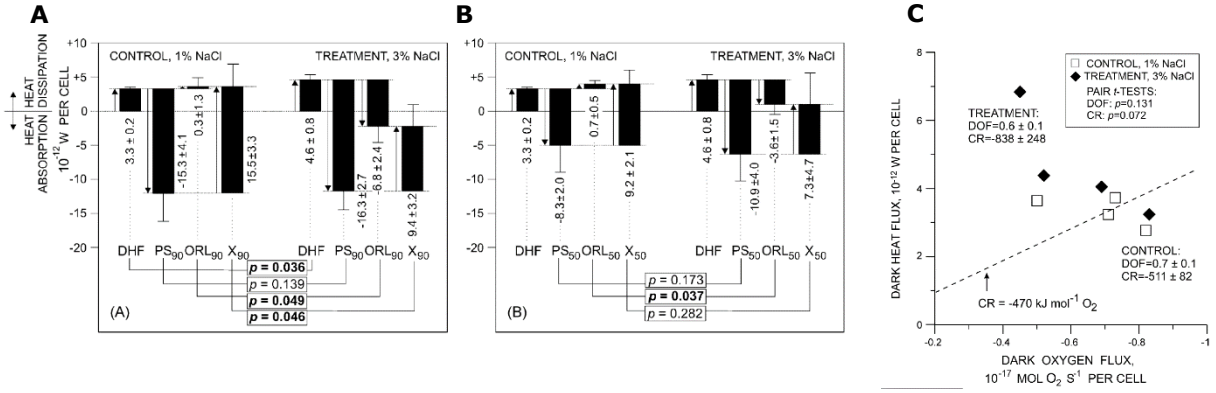

Figure 2. Energy balances combining photocalorimetry and high-resolution respirometry in the light at **A)** 90 µmol photon $m^{-2}s^{-1}$ and **B)** 50 µmol photon $m^{-2}s^{-1}$. The combination of both techniques revealed an extra source of heat. **C)** The comparison between dark heat flux and dark oxygen flow allowed to estimate the calorimetric/respirometric ratio (CR) (i.e. similar to oxycaloric equivalent). For glucose, the CR is -470 kJ mol^{-1} O_2, meaning that at least one anaerobic process occurred in aerobic conditions in the stressed cells. DHF (dark heat flux, PS (photosynthesis at 50 and 90 µmol photons $m^{-2}s^{-1}$), ORL (observed response to light), X (X-factor or the difference between the expected net heat flux (DHF+PS) and the observed one (DHF+ORL), PS-ORL). Values are mean ± SE (*n*=4).

The combination of photocalorimetric and respirometric measurements allowed to identify the stimulation of anaerobic processes in *D. maritima* growing under salt stress conditions

Reference: Moukhanov V & Kemp R (2006) Simultaneous photocalorimetric and oxygen polarographic measurements on Dunaliella maritima cells reveal a thermal discrepancy that could be due to nonphotochemical quenching. Termochim Acta.

Figures and texts slightly modified based on the recommendations of the COST Action MitoEAGLE CA15203. doi:10.26124/mitofit:190001.v4