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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

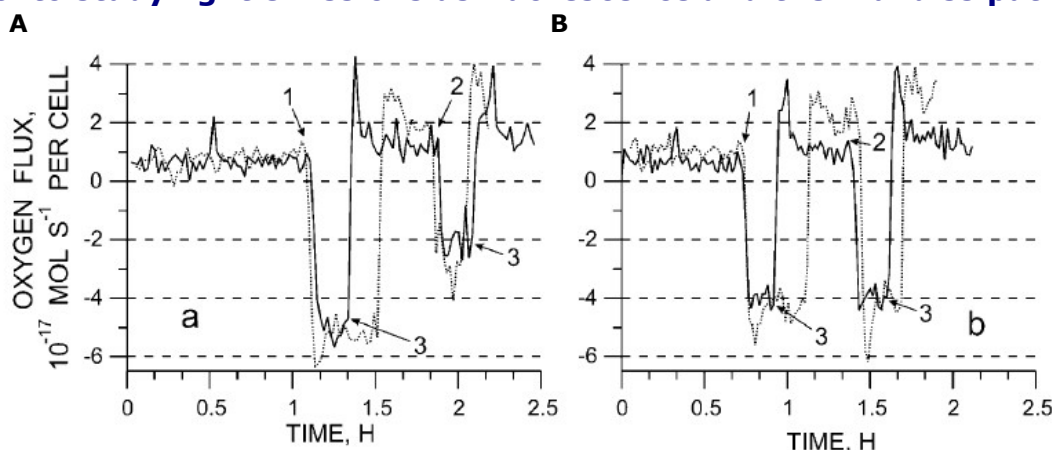


Figure 1. Oxygen consumption of *Dunaliella maritima* in dark and light. **a)** control and **b)** salt stressed cells. The arrows indicate the time points of (1) switching the light at $90 \mu\text{mol photons m}^{-2} \text{s}^{-1}$, (2) $50 \mu\text{mol photons m}^{-2} \text{s}^{-1}$ and (3) switching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

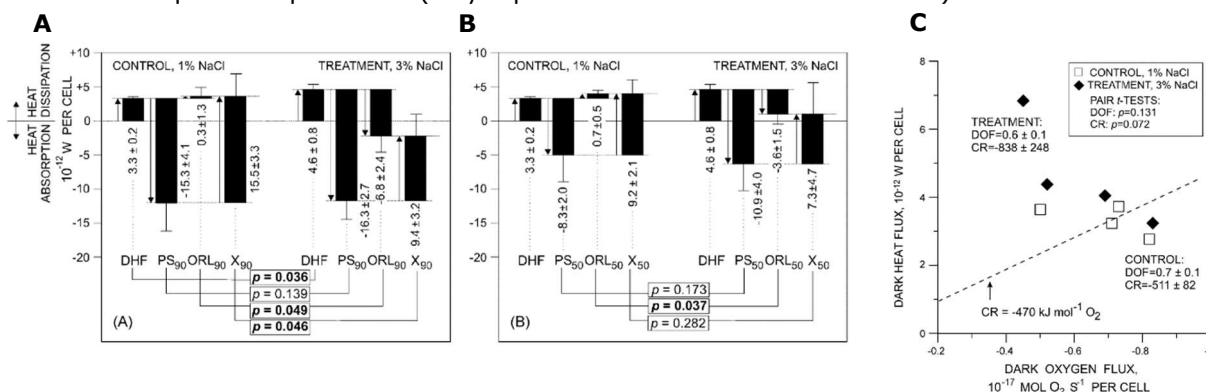


Figure 2. Energy balances combining photocalorimetry and high-resolution respirometry in the light at **a)** $90 \mu\text{mol photon m}^{-2} \text{s}^{-1}$ and **b)** $50 \mu\text{mol photon m}^{-2} \text{s}^{-1}$. The combination of both techniques revealed an extra source of heat. **c)** The comparison 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 $-470 \text{ kJ mol}^{-1} \text{ O}_2$, meaning that at least one anaerobic process occurred in aerobic conditions in the stressed cells. DHF (dark heat flux), PS (photosynthesis at 50 and $90 \mu\text{mol photons m}^{-2} \text{s}^{-1}$), 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 \pm 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. Thermochim Acta.