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Changes of chlorophyll fluorescence in response to dehydration stress of lichen photobionts

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Abstract

Lichens are symbiotic organisms capable to grow in extreme conditions and photosynthesize under severe dehydration (less than 10% of relative water content) successfully. They possess a green alga, or cyanobacteria (both in some cases) as photobionts, which provide enough metabolites for photobiont and fungal symbiont. The photobionts are considered desiccation tolerant.

Chlorophyll fluorescence was used to measure tolerance of different lichens to dehydration. Fast chlorophyll fluorescence transients (OJIPs) are fast and efficient method for evaluating photosynthetic performance of any photo synthetizing organism. The method evaluates sensitively the changes caused in photosynthetic apparatus by variety of abiotic stressors (e.g. dehydration, low/high temperature, high irradiation). The shape of OJIP reflects functioning of photosystem II, openness of reaction centres for energy flow and potential quantum yield of PSII photochemistry.

In our study, we focused on six foliose lichen species, collected in southern Norway. We measured species-specific photosynthetic response of lichens to the gradual dehydration in laboratory conditions with a special respect to cyanobacterial/algal photobiont. The cyanobacteria-possessing lichen *Peltigera praetextata* showed typical flat shape of OJIP transient with critical dehydration point at 40% of relative water content (RWC). Lichen species with algal photobiont (*Peltigera leucophlebia* and *Umbilicaria spodochora*) had higher chlorophyll fluorescence signals and proved to be more dehydration-tolerant. They kept primary photosynthesis until critical RWC of 35%. The most stress-resistant were three different *Lobaria* species that reached critical point at about 20% RWC. Majority of OJIP-derived chlorophyll fluorescence parameters (F_M, F_0, F_J, F_I) declined with RWC decreade accoring to a S-curve in all species

Biography:

I graduated in molecular biology and plant cytogenetics, however, started my PhD in ecophysiology of photosynthesis in polar autotrophs. My research is focused on photosynthetic performance of polar lichens and their photobionts, as affected by dehydration and low temperature.

I combine laboratory- and field-based research. I was a member of two Czech expeditions (2018, 2019) to the Johann Gregor Mendel Czech Antarctic station (James Ross Island, Antarctica) responsible for lichen ecophysiological studies. Within an international exchange, I studied the effects of dehydration on foliose lichens at the Norwegian University of Life Sciences (As, Norway).