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REVEALING THE LONG-TERM EFFECT OF UV-PROTECTANT USNIC ACID REMOVAL ON DIFFERENT LIGHT PROTECTION MECHANISMS

Az UV-védő uzneasav eltávolításának különböző fényvédelemi mechanizmusokra gyakorolt hosszú távú hatása

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Terricolous lichens are abundant inhabitants of semi-arid grasslands, where the lichen thalli are exposed to high irradiation and have to defend themselves against harmful excess light energy reaching algal cells. Since the algal partner produces the primer carbon source for both symbionts, the photoprotection of the algae is essential. The UV-protectant lichen metabolites and different quenching procedures of the alga ensure adequate defending mechanisms. However, what happens when one of the protection mechanisms is reduced near zero? Since the long-term effect of diminishing UV-protectant lichen metabolites had been unknown, a major part of usnic acid was removed from *Cladonia foliacea* thalli deriving from lowland and mountain sites by acetone rinsing. After that, the lichens were maintained under field conditions to investigate the effect on both symbionts for three years. Similarly, treated thalli of mountain origin were transplanted to the lowland site to study the potential difference between functions deriving from long-term adaptation and short-term acclimation mechanisms. We aimed to determine if the decreased level of usnic acid caused an elevated photoprotection in the algae and to reveal the dynamics of metabolite production in lowland and mountain thalli. Photosynthetic activity and light protection were checked by chlorophyll *a* fluorescence kinetics measurements, and the concentration of usnic acid was monitored by chromatographic methods every six months. Our results pointed out that seasonality had a more pronounced effect than that of acetone treatment on the photosynthetic and photoprotective function of algae over a long-term scale. The concentration of usnic acid has started to increase in acetone-treated thalli; however, even after three years, the treated thalli contained half as much usnic acid as the control thalli, and the level of photoprotection remained unchanged in the algae. Usnic acid showed higher concentrations in the lowland than in the mountain samples during the whole investigation period, which can be explained by a long-term adaptation of the fungi that did not change with transplantation. Our results also showed that the available humidity was a more critical limiting environmental factor than the amount of incoming irradiation affecting usnic acid production under semi-arid environmental conditions. This research was supported by the grant NKFI K 124341.