



Biological Soil Crusts: Limits of Radiation, Desiccation, and Oxidation Tolerance

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Biological soil crusts in deserts, which are commonly formed by lichens – symbiotic associations between fungi and algae/cyanobacteria – are destroyed during the construction of solar facilities, leading to increased dust emissions. To obtain useful information for crust restoration, we studied in the laboratory the effects of ultraviolet radiation (UV), desiccation, and photochemical oxidation on two common lichens from the Mojave Desert. Following exposure to a given stress in a desiccated state, the specimens were rehydrated while the recovery of chlorophyll fluorescence was monitored. Results show that oxidation is more damaging than UV, which in turn is more damaging than desiccation. Specifically, three days of fumigation in ozone at 68.3 g/Nm^3 is lethal or nearly lethal, while UVC irradiation for one week at 38.2 W/m^2 only resulted in minor, recoverable injury (this is five orders of magnitude more resistant than *E. coli*). In contrast, virtually no damage occurred to the lichens even after thirty wet-dry cycles. Our research suggests that amending the soil with reduced organics would help counteract oxidation and thereby facilitate crust restoration.



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