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Physiological response of BSC phototrophic community to EPS removal

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Biological Soil Crusts (BSCs) are associations between soil particles and varying proportions of cyanobacteria, heterotrophic bacteria, algae, fungi, lichens and mosses. BSCs play a major role in soil stabilization, and in drylands have been well acknowledged for mitigating desertification effects.
Amongst the wide diversity of organisms that compose BSCs, cyanobacteria are the first primary producers: they colonize nutrient-limited soils, modifying the micro-environment through the excretion of large amounts of extracellular polymeric substances (EPSs). EPSs represent a huge carbon and nitrogen source for other inhabitants of the crust, are three-dimensionally spread through the first millimeters of the soil, and have a recognized role in influencing the hydrological behavior of the crust.
The aim of this study was to investigate the possible role that EPSs play in the physiology of the phototrophic community residing on a light crust (without mosses or lichens, thus mainly inhabited by cyanobacteria and algae). In particular it was investigated whether the three-dimensional matrix in which EPSs are organized allowed light distribution and diffusion inside the crust, thus influencing photosynthesis.
Non-invasive techniques were used to extract the polymeric matrix and to analyze photosynthetic performances in native and extracted BSC samples.
Preliminary results suggested that the mild extraction protocol allowed to remove a portion of the matrix, and that this treatment revealed highly significant differences in the optical properties of the crusts comparing native and extracted samples. The extraction did not affect cell viability, as samples after the extraction were still photosynthetically active. However, chlorophyll variable fluorescence was significantly lower in the extracted samples than in native ones, and susceptibility to photoinhibition was significantly modified.
Evaluating the role of the EPSs in the community is essential to further understand the equilibrium of such fragile systems as BSCs. Indeed, an effect on the photosynthetic activity would be linked to primary production, thus to the existence, survival, and development of BSCs themselves.

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