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Biological soil crusts as a mechanism to protect areas under sandization processes in southern Brazil

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Biological Soil Crusts (biocrusts) are communities of algae, lichens, mosses, cyanobacteria, and other nonvascular organisms living in the soil surfaces. Biocrusts are a key factor in the protection of arid and semiarid ecosystems and, therefore, playing a major role against desertification. Biocrusts are also of profound importance in sand dune areas, as they are recognized as the first colonizers after environmental disturbances and can help preventing sediment remobilization. Moreover, biocrusts have shown to be of importance in soil protection against erosion, but also nutrient cycling in the Pampa biome in Brazil. Here, natural geomorphological processes and soil misuse led to the expansion of sediment remobilization areas, generating a severe problem - the difficulty of fixing field vegetation and crops. The present study investigates the behavior and interrelationships of biocrusts specifically in areas that suffer sandization in the Brazilian Pampa biome and verifies their relationship with soils and soil organisms. We analyzed biocrusts in three consecutive stages. Starting with a taxonomic exploration of the dominant component of cyanobacteria, proceeding to its characterization and finally determining its importance. We investigated two study sites in São Francisco de Assis and samples were collected in May 2016 and October 2019. The sites are characterized by sandy soils that suffer gullying, one without human intervention and the other one with artificially stabilized ravines. The analysis of biological material was carried out with microscopy, and it could be determined that the composition consists of 13 taxa of cyanobacteria and one filamentous species, *Stigonema* sp., could be specifically highlighted. These black to dark green spotty communities on the soil surface played an important role in particle aggregation, which can be granulated and show macroscopic forms. When analyzing the location of the biocrusts within the topography, it was observed that they occur in

more humid places, occupying the same positions in all relief compartments. Biocrusts mostly develop on the top of the gullies or on upper and more stabilized slopes, especially when facing southern orientation. Taking into account the biocrust cover, we can identify different morphologies such as smooth, rolling and pinnacle blocks, which showed us different combinations according to the degree of evolution related to the micromorphology of the relief. We found that the presence of these biocrusts as an element of nutrient source and balance generator can lead to a reduction of soil erosion and was thus of outmost importance for the restoration of this biome.