



CHARACTERIZATION OF CYANOBACTERIA ISOLATED FROM BSC (BIOLOGICAL SOIL CRUSTS) AND THEIR APPLICATION FOR A SUSTAINABLE AGRICULTURE

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Land degradation is a global environmental issue that affects the world's arable lands on a large scale, thus the preservation of the functions of the soil was included among the Sustainable Development Goals (SDGs) of the 2030 agenda. To combat this degradation, some researchers have focused on the use of Biological Soil Crusts (BSC): communities of cyanobacteria, algae, lichens, mosses, and other organisms living in association with soil particles. BSC are common in many ecosystems and especially drylands. They perform multiple functions in the ecosystem, such as stabilizing soil surfaces to prevent erosion, contributing carbon through photosynthesis, fixing nitrogen, and regulating the dryland hydrological cycle. Due to their functions at the soil level, BSC have emerged as a potential tool in restoration. Among the microorganisms that compose the BSC, cyanobacteria, thanks to their characteristics, are ideal candidates for their use for the restoration of arid soils and for sustainable agriculture. In the present project, cyanobacteria present in BSC will be selected from different locations in Italy and Spain and, in a second phase, it will be investigated the effect of inoculation of these cyanobacteria on the fertility – physical, chemical, and biological – of agricultural soils. The project will be developed in collaboration with the University of Almeria (Spain) and will also involve the FertiGlobal® division of the SCL Italia Spa company, which carries out innovative technologies to support agriculture, such as the production of biostimulants for crops.

The objectives of the project are I) to isolate species of cyanobacteria from BSC with functional characteristics to increase the fertility of agricultural soils, II) to identify the most efficient, economical, and sustainable soil inoculation strategy, III) to evaluate the potential of cyanobacteria as plant biostimulants.

The identification of cyanobacteria strains will be carried out with both morphological and molecular studies. These cyanobacteria will be analyzed to identify key characteristics such as the ability to fix nitrogen, the secretion of EPS (Exopolysaccharides), and the ability to grow and survive, both in a liquid medium and in the soil. These data will allow the selection of the best strains for the intended purposes. Once selected, cyanobacteria strains will be used in both *ex-situ* and *in-situ* experiments to test their ability to increase soil fertility. During the period at the SCL Italia Spa company, cyanobacteria strains will be used to test their activity as biostimulants through germination and growth experiments on target plants.

The main results of this project will be to broaden the taxonomic and phylogenetic knowledge of some species of cyanobacteria isolated from BSC, to explore the potential of cyanobacteria as biofertilizers and biostimulants, and to lay the foundations for the commercialization of cyanobacteria-based products, increasing the sustainability of agricultural production and contributing to the reduction of the impacts of climate change by promoting the ecological transition.