BIOSPIR: VALORIZATION OF SPIRULINA'S BIOMASS AS BIOSTIMULANT IN AGRICULTURE: DEVELOPMENT OF A GREEN PRODUCT TO IMPROVE SUSTAINABILITY AND CIRCULAR ECONOMY

PhD Student: Alberta Di Cave / *Academic Tutor*: Prof.ssa Laura Bruno / *Co-supervisor*: Giada Migliore

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Climate changes and environmental degradation are a serious threat for the planet. European State members are committing to apply climate, energy, and transports policies to reduce greenhouse gas emissions of 55% by 2030. The goal is to develop new strategies for a modern economy, efficient and competitive. The "Biodiversity 2030" and the "Farm to Fork" strategies aim to make agri-food systems fully sustainable. Fertilization is indeed an important practice for the agri-food system to improve crop yield, but there are downsides. According to European Regulation (EU 2019/1009) pollutants in fertilizer products could be harmful for human, animal, and vegetable safety. Moreover, they can have negative impacts on the environment and soil health. Plant biostimulants, that boost plants' natural nutritional processes, optimise production and increase plants' tolerance to abiotic stress, while reducing the need for nutrient inputs. The primary objective of this research is to develop an effective and useful plant biostimulant to support the development of sustainable farming. The research is also part of the circular economy, with the aim of turning an algal waste biomass into a valuable agronomic biostimulant. The cyanobacterium Spirulina (*Arthrospira platensis*) is currently used as a feed and food integrator and for the extraction of phycocyanin used as a natural food colouring agent and as an antioxidant, anti-inflammatory, anti-cancer and neuroprotective agent in pharmacology. The residual algal biomass from phycocyanin extraction is still rich in nutrients and can be useful as a natural biostimulant. The characterisation of the biomass, the development of the plant biostimulant and the set-up of an applicative protocol on a target crop will be carried out at the Department of Biology of the University of Rome 'Tor Vergata'. Furthermore, the effect of the addition of the biostimulant on the soil microbial community will be assessed by analysing the community metabolism and by taxonomic and functional characterisation of the soil microbial pool at the Laboratory of Observation and Measurements for the Environment and Climate (SSPT-PROTER-OEM) of ENEA RC Casaccia. The PhD project also aims to assess the applicability and effectiveness of the biostimulant in the hydroponic and aquaponic systems of the company The Circle srl.

The BIOSPIR project perfectly addresses to the need to reduce the use of chemical fertilizers to ensure a clean supply chain, protect biodiversity, and soil functionality. Furthermore, through the reuse and refinement of production waste, it responds to the need to integrate the food production chain with the non-food one in the concept of 'circular economy' that represents a driving force for the so-called bioeconomy.