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APPLICATION OF MICROBIAL CONSORTIA AND BIOCHAR FOR SUSTAINABLE LETTUCE AND ROCKET CULTIVATION

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Agricultural practices are moving to a more sustainable and environmentally friendly approach. The use of microbial biostimulants is a promising ecological innovation that can complement traditional agricultural approaches. Microorganisms can have a direct action on the crop through the establishment of a mutual symbiotic association (e.g., Mycorrhiza), or indirectly by increasing the nutrients' bioavailability to plants. There are also some microbial species (Pseudomonas fluorescens, Bacillus spp, Burkholderia, and others) which are recognised as Plant Growth Promoting Microorganisms (PGPM) and they can induce molecular, biochemical, physiological, and morpho-anatomical responses in plants that can both influence crop productivity and protect plants from diseases and abiotic stresses. Biochar, a heterogeneous carbon-rich substance produced by the pyrolysis of vegetable biomass, is characterised by chemical-physical properties, such as porosity and elemental composition that make it an efficient amendment and a soil improver. Moreover, the characteristics of the biochar and its structure are suitable for a superficial and internal bacterial colonization, making it a growth habitat favorable to microbial proliferation.

In recent years, the interest for the consumption of fruits and vegetables characterized by a high content of bioactive substances has strongly increased. It is known that these are beneficial because besides providing essential nutrients for the human body, they have positive effects on human health. Among these 'baby leaves' vegetables are gaining popularity among

consumers worldwide, as they represent a good source of minerals, vitamins and phytochemicals of considerable antioxidant potential. In this work, lettuce (Lactuca sativa L.) and rocket (Eruca sativa Mill.) two widely utilized baby leaves vegetables, were grown in controlled conditions in a glasshouse in the presence of microbial consortia composed by different plant growth promoting bacteria and fungi. The consortia were applied by seed coating or directly to soil in the presence of biochar as a carrier. Furthermore, to test the synergic effect of biochar and bacterial and fungal consortia, an experiment conducted both in greenhouses and field conditions has been set up on lettuce plants.

The effects of the growing conditions on the plants physiological status have been periodically evaluated measuring leaves chlorophyll content (SPAD) and leaf transpiration rate (AP4 porometer). In the short period, germination efficiency, shoots and roots lengths were also evaluated. At the end of the experiment, biomass and leaves water content were evaluated; samples of leaves were collected and analysed for the content of different metabolites as polyphenolic compounds, carotenoids, chlorophylls, together with the antioxidants potential.

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