

The interaction between ectomycorrhizal fungi and growth promoting bacteria in plant development from in-vitro to the field

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Abstract: There is currently an array of biotechnological tools which may positively influence plant development and establishment. Symbiosis with ectomycorrhizal fungi is known to improve plant health by increasing nutrient and water uptake and alleviating environmental stresses. Some rhizosphere bacteria are also proven to act as plant stimulating agents, health managers and growth promoters. The use of a combined inoculum using both microorganisms has great potential in forestry. Nevertheless, the interaction between fungi and bacteria is highly specific and bacteria are known not only to enhance fungal growth (mycorrhiza promoting bacteria), but also to strongly inhibit it. It is therefore important to evaluate the compatibility between ectomycorrhizal fungi and bacteria and to determine the impact of such combination in plant development when aiming at the use of optimized microbial inoculum for enhancing plant growth. In the present work we investigated the use of a dual inoculation system, consisting of a bacterial strain from the genus *Mesorhizobium* in combination with ectomycorrhizal fungi, from in-vitro tests to a nursery stage followed by transplantation to the field. Approximately 5000 seedlings were used in these experiments comprising *Quercus suber*, *Quercus robur*, *Quercus rubra*, *Pinus pinaster* and *Pinus pinea*. Seedlings were grown for 9 months in a commercial forest greenhouse and then transplanted to 4 locations in Portugal. The first sampling was made before field transplantation. Results showed that the combined use of fungi-bacteria inoculum significantly influenced plant growth and its effect was different from that of each individual microbial partner, emphasizing the strong interaction between microorganisms.

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