

Use of mycorrhizae to increase survival and resilience of transplanted plants in habitat restoration practices

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Introduction

The UN's 2030 Agenda for Sustainable Development calls for the preservation of biodiversity, which is threatened due to habitat degradation and climate change. Ectomycorrhizal fungi (ECM) are fundamental for terrestrial ecosystems, Actions to enhance restoration and resilience of habitats to reduce biodiversity loss enhancing plant productivity, alleviating abiotic and oxidative stress, and regulating biodiversity where species can persist with all their natural ecological interactions, The aim of the project was to investigate the use of indigenous ECM to enhance the latter element is often ignored. Criticalities can arise when ex-situ grown acclimatization and survival of ex-situ grown plants translocated for habitat indigenous plants are translocated in-situ, without their natural soil microbial restoration.

Materials and Methods

1. Collection in Natura 2000 sites > 2. Morphological identification > 3. Database accession > 4. Preservation > 5. Propagation > 6. Inoculation

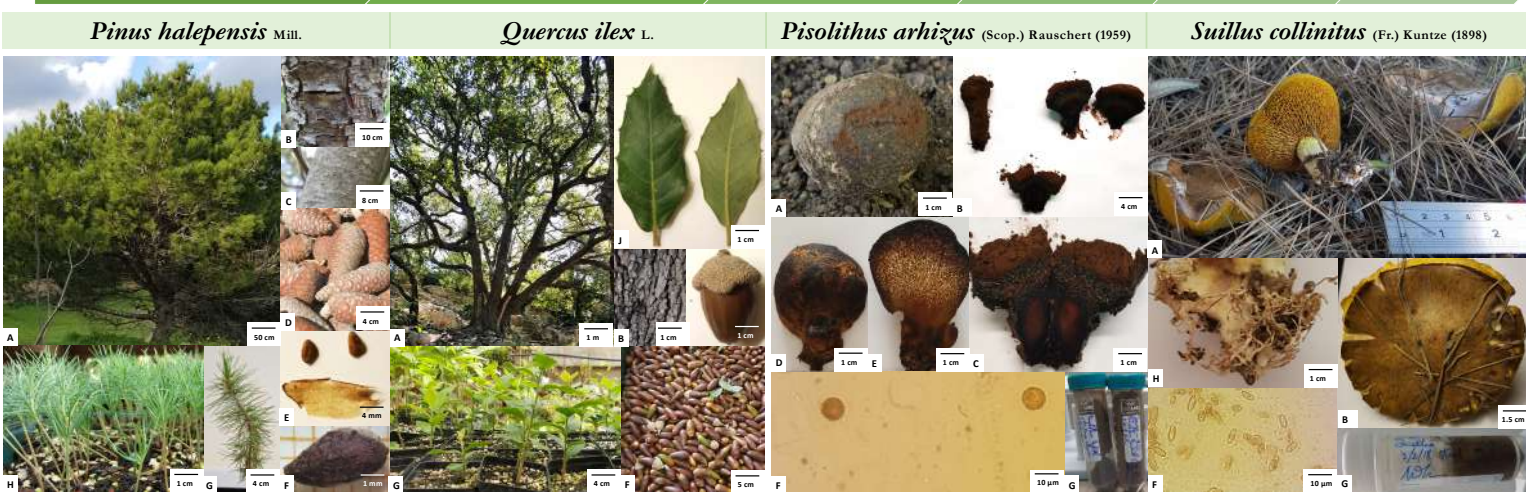


Figure 1. A Mother plant; B-C Bark; D Cones; E-F Seeds; G-H Seedlings; J Leaves.

Figure 2. A,B,C Mature sporocarps; D,E Immature sporocarps; F Spores; G Preservation; H Mycelium.

Results

Pinus halepensis and *Quercus ilex* (Figure 1) seeds collected in Natura 2000 sites of the Maltese Islands were successfully germinated, achieving a germination of 52% and 76% respectively. Sporocarps of naturally associated indigenous ectomycorrhizal fungi of *Suillus collinitus* and *Pisolithus arhizus* (Figure 2) were also collected in the same Natura 2000 sites. After a period of 1 year both ectomycorrhizal association were recorded as shown in Figure 3 and 4. For *P. halepensis* and *S. collinitus* was possible to also inoculate other seedlings through the technique of Mother Donor Plant, as shown in Figure 3. Whereas, for *Q. ilex* and *P. arhizus* was not possible to inoculate other seedlings but was possible to observe primordia of the fungus growing next to a mycorrhized root, as shown in Figure 4. Both experiments are still on going at the Seed Bank of the Department of Biology at University of Malta.

Pinus halepensis and *Suillus collinitus*



Figure 3. Showing preparation of MDP and RP before removing pots and topping with compost. Changes in root development as result of ECM association.

Quercus ilex and *Pisolithus arhizus*

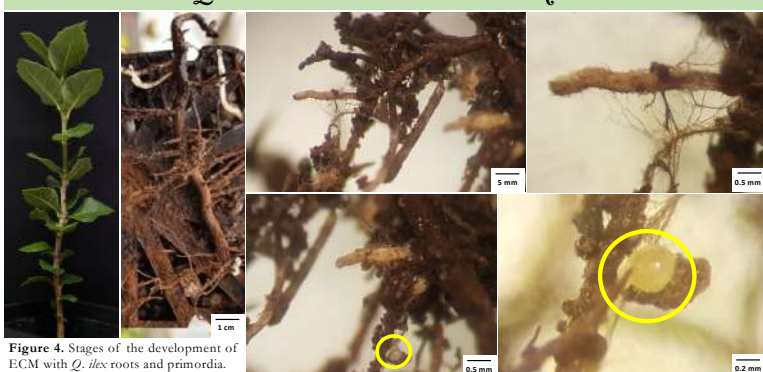


Figure 4. Stages of the development of ECM with *Q. ilex* roots and primordia.

Conclusion

All the mycorrhized plantlets produced will be reintroduced next fall into selected area of Natura 2000 sites in the Maltese Islands as part of SiMaSeed restoration project. In the present study ectomycorrhizal fungi (ECM) have been used, however it is nonetheless possible to use indigenous Arbuscular Mycorrhizal Fungi (AMF) as well as other soil born beneficial fungi such as *Trichoderma* spp. in habitat restoration practises.

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- SiMaSeed - Protecting biodiversity in Sicily-Malta Natura2000 sites through Seed Banks and population reinforcement, has a total budget of 1.806.877 € and involves 4 project partners. This project is part financed by the European Union European Regional Development Fund (ERDF), through the INTERREG V-A Italy-Malta Programme. Co-Financing rate 85% EU Funds, 15% National Funds.