

Preliminary data on the underground diversity of alder (Alnus glutinosa) associated fungi



V. Daskalopoulos, I. Kefalogianni, A. Venieraki, E. Polemis and G.I. Zervakis^{1,*}

Agricultural University of Athens, Laboratory of General and Agricultural Microbiology, Iera Odos 75, 11855 Athens (*e-mail: zervakis@aua.gr)

Introduction

Alluvial forests with alder trees (Alnus glutinosa) constitute a habitat of particular interest (priority habitat 91Eo*). The alder woodlands of Andros island occur at the southernmost limit of their distribution in Europe. They present a patchy distribution along the main streams of site GR4220001, mainly at Vori stream, while several other smaller alluvial stands exist along other streams. These sites have suffered severe degradation as a result of extensive flooding in recent years (Fig. 1) and restoration actions are implemented in the frame of LIFE Andros Park project.

Alders are known to form symbiotic relationships with both ectomycorrhizal (ECM) fungi and nitrofixative actinobacteria (Frankia spp.), and there is evidence that alder-associated ECM fungi show a remarkably high degree of host specificity compared with other tree species (Griesser, 1992; Arnolds et al., 1995, Pritsch et al., 1997). It has been suggested that the abundant occurrence of symbiotic fungi in these adverse environmental conditions, contribute significantly on alder survival and growth. Among the objectives of this project was to collect, isolate and identify as many as possible of the alder-associated fungi and to evaluate the potential use of selected strains to serve as inocula for enhancing the adaptability/growth of young alder seedlings in restoration/regeneration of deteriorated A. glutinosa stands.



Methods

Several field-trips were performed in selected sites of Andros during the years 2017 and 2018. A. glutinosa roots (Fig. 3a) sampling took place in four mountainous (>500 m a.s.l.; Zenio, Evrousies, Vourkoti, Katakaleoi) and three coastal or low-altitude (0-250 m a.s.l.; Achla, Vori and Lefka) alder stands (Fig. 2). Endophytic fungi of ECM root tips (Fig. 3b), root nodules (Fig. 3c) and rhizosphere soil samples were processed, and their associated fungi were isolated in pure cultures by using various methods. Finally the isolated fungi were identified by morphological and molecular (DNA sequencing) approaches.



Outcome

The identity of 25 isolates was determined; 12 of them were found to belong to the following species: Alternaria alternata, Apiognomonia lasiopetali, Chaetomium murorum, Fusarium solani, Ilyonectria radicicola, Lambertella tubulosa, Metacordyceps chlamydosporia, Neurospora reticulata, Penicillium chrysogenum, Phialocephala fortinii, Pleurotus ostreatus and Talaromyces ruber. In addition, 13 isolates were identified to genus level, i.e. Botrytis, Fusarium, Knufia, Penicillium, Phomopsis, Trichoderma and Umbellopsis. The majority of cultures identified are soil-borne ascomycetes which generally possess an opportunistic ecology, maneuvering between different trophic habits depending on environmental conditions.



s/n	Identity	Comments (sample type, geographic origin)
1	Alternaria alternata	Root fragments incl. nodule-like structures (Katakalaioi) [Fig. 4a,b]
2	Apiognomonia lasiopetali	Ectomycorrhizal tip (Vourkoti) [Fig. 5a,b]
3	Botrytis sp.	Rhizosphere soil, under Inocybe basidiomes (Vori)
4	Chaetomium murorum	Root fragments including nodule-like structures (Katakalaioi)
5	Fusarium solani	Root fragments including nodule-like structures (Katakalaioi)
6	Fusarium sp.	Root fragments including nodule-like structures (Katakalaioi)
7	Ilyonectria radicicola	Root fragments including nodule-like structures (Katakalaioi)
8	Knufia sp.	Ectomycorrhizal tip, under Naucoria sp. basidiomes (Vori)
9	Lambertella tubulosa	Ectomycorrhizal tip (Vourkoti)
10	Metacordyceps chlamydosporia	Ectomycorrhizal tip (Katakaleoi) [Fig. 6a,b]
11	Neurospora reticulata	Root fragments including nodule-like structures (Achla) [Fig. 7a,b]
12	Penicillium chrysogenum	Rhizosphere soil, under Naucoria basidiomes (Vori)
13	Penicillium sp. 1	Rhizosphere soil, under Inocybe and Tomentella basidiomes (Vori)
14	Penicillium sp. 2	Rhizosphere soil
15	Phialocephala fortinii	Ectomycorrhizal tip (Achla) [Fig. 8a,b]
16	Phomopsis sp.	Ectomycorrhizal tip (Katakaleoi) / Rhizosphere soil under <i>Tomentella</i> basidiomes (Vori) / Root fragments including nodule-like structures (Katakaleoi)
17	Pleurotus ostreatus	Rhizosphere soil (Vori)
18	Talaromyces ruber	Rhizosphere soil, under Inocybe basidiomes (Vori) [Fig. 9a,b]



Alternaria alternate; conidia cylindrical, multi-septate, brown colored



Apiognomonia lasiopetali; dark colony and septate hyphae with conidia



Metacordyceps chlamydosporia; colony and hyphae





Neurospora reticulata, perithecium, asci and ascospores



19	Trichoderma sp.	Rhizosphere soil, under Tomentella basidiomes (Vori)
20	Umbelopsis sp.	Ectomycorrhizal tip (Vourkoti)

Phialocephala fortinii; colony and circular pigmented hyphae

Talaromyces ruber; conidiophore phialidia, conidia spherical, colored

Acknowledgments

This study was funded by the project titled: "LIFE Andros Park - Conservation of priority species and habitats of Andros Island protected area integrating socioeconomic considerations" (European Commission – LIFE Nature, LIFE16 NAT/GR/000606).

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