Online resource 3. Additional information about ectomycorrhizal fungi associated with European beech in forest bare–root forest nurseries

DIVISION	ORDER	FUNGUS TAXON/FUNGI GROUP	DESCRIPTION
Ascomycota	*Pezizales*	*Tuber* spp.	Tuber sp. 1 was the most frequent type of ectomycorrhiza among the Pezizales, found in all tested nurseries and showing a high degree of homology (99–100%) with unidentified species of nursery mycorrhizas (FJ348400 and GQ154518) found in the USA on *Quercus garryana* and in Poland on *Quercus robur* and *Quercus petraea* seedlings (10, 17). *Tuber* sp. 2 and *Tuber maculatum* were found only in a single nursery. *Tuber* sp. are commonly reported as nursery colonizers (6, 9, 10,13, 16), although their species-level determination is rather low and needs further resolving, especially for non-economical and less studied clades (that is, Rufum, Puberulum and Maculatum).
		Peziza sp.	The ITS rDNA sequence of *Peziza* sp. shares a high level of similarity (97%) with the fruiting body of *P. ostracoderma* (EU81946), but fully matched (100%) with uncultured *Peziza* sp. (GQ154504) from our earlier study on oak seedlings from different nurseries (10). These results suggest the ubiquitous occurrence of this species in nursery environments.
		Geopora cervina	This is a first record of *Geopora cervina* as a mycorrhizal symbiont of beech seedlings. Potential ectomycorrhizal relationships between the *Geopora* genus and various deciduous trees, such as *Quercus* sp. and *Populus* sp., have previously been reported (12) and subsequently confirmed by phylogenetic analyzes of the LSU rDNA region from mycorrhizal root tips and fruiting bodies (22). Members of this genus are considered well-suited to the stressful environment (3) that is often assumed to occur in forest nurseries.

Ascomycota	*Pezizales*	*Hydnotrya tulasnei*	*Hydnotrya tulasnei* is an Ascomycetes species found in only one nursery but in very high abundance. ITS sequence from this mycorrhiza showed a high homology (99%) to the *H. tulasnei* fruiting body voucher (UDB000095) from beech forest (1). This is in accordance with the findings of Stielow et al. (18), which defined *H. tulasnei* as a species strongly associated with deciduous trees, mainly *F. sylvatica*. Factors inducing dominance of *H. tulasnei* in one of tested nursery (PRU) remain obscure.
		Other *Pezizales*	An uncultured species detected in the SUSZ nursery, initially designated as an "uncultured fungus" (based on the closest BLAST match to uncultured fungus EF484935), was classified as Pezizales because it formed a clade (data not shown) with members of Pezizales (*Geopora* sp., *Peziza* sp., and *Tuber* sp.). Unidentified Pezizales sp. was also detected on larch (9) and oak (10) that were grown in bare–root forest nurseries. Therefore, both earlier results and our results here clearly indicate that Pezizales contains common generalists in forest nursery circumstances.
	Dothideo mycetes	*Cenococcum geophilum* agg.	*Cenococcum geophilum* agg. was present in three nurseries, at trace abundance (0.12–1.82%). *Cenococcum geophilum* aggregate is a widespread, multi-host ectomycorrhizal fungus, which frequently dominates in ecosystems where there are harsh environmental conditions, such as drought (11). The most probable explanation of the low abundance of *C. geophilum* agg. in our studies is that all the tested nurseries possessed an irrigation system, thereby precluding any possibility of periods of drought.
	Helotiales	*Cadophora*/ *Rhizoscyphus*	According to Vrålstad et al. (24), separation of species and phylogenetic relationships within this group are not clear. Recently, it has been shown that *Rhizoscyphus ericae*, the archetypal ericoid mycorrhizal fungus, forms ectomycorrhizas predominantly on conifers and on some deciduous trees, for example, birch (24) and oaks (10). The known *Cadophora* species appear to be plant pathogens or root associates (4). For example, *Cadophora finlandia* has earlier been reported to form both ECM and ericoid symbiosis (24), and was detected as mycorrhizas in forest nurseries (16).

Basidiomycota	*Agaricales*	*Hebeloma* spp	Of four identified *Hebeloma* species, *H. sacchariolens* have been the most common and abundant. This species was also common on oak seedlings in our previous studies (10). On the beech seedlings, we also reported one of the few observations of *H. cavipes* in Poland. This species was regarded as rare in Europe; however, recently their presence on Scots pine seedlings was reported in Lithuanian nurseries (14).
		Naucoria salicis.	This is a first record of *Naucoria salicis* associated with *F. sylvatica*. Previously, *Naucoria* species (synonym *Alnicola*) were generally reported as specific to *Alnus*, although a few are mycobionts of *Salix* or other deciduous hosts, such as *Quercus* (10, 15) and *Betula* (8).
		Hymenogaster decorus	This is a second record of this taxon (syn. *H. olivaceus*) in Poland (23). Up to now fungi from the genus *Hymenogaster* has been assigned as an ECM fungi on the basis of the occurrence of fruiting bodies in the vicinity of host trees (19, and citation therein).
		Laccaria tortilis	Fruiting bodies of ECM fungi rarely appear in nursery conditions; members of *Laccaria* genus are the exceptions. In our studies, numerous fruiting bodies of *L. tortilis* were noted. Their mycorrhizas were observed with various abundance (0.9 – 23%) in three nurseries. Previously mycorrhizas of *L. tortilis* were reported on oak seedlings (10).
	Telephorales	*Tomentella* spp.	Occurrence of Tomentelloid fungi in the nursery environment is not surprising, given their worldwide distribution and formation of associations with gymnosperms (eg 21), angiosperms (eg 7) and even with orchids (20).
	Boletales	*Scleroderma* spp.	Three *Scleroderma* species: *S. citrinum*, *S. leave* and *S. verrucosum* have been found. Recent surveys also revealed *S. areolatum* on oak seedlings in forest nurseries (10). All of these species transform fine roots into copious, long and tortuous silver-white mycorrhizas indistinguishable from each other based on morphological features (Online Resources 1). Molecular methods have significantly advanced resolution to species level in this respect.
	Rusullales	*Lactarius* sp.	In one of the tested nurseries (SUSZ), an unidentified *Lactarius* species was found. This result was rather unexpected, as observations on fruiting behavior have suggested that the majority of *Lactarius* species are late-stage ectomycorrhizal colonizers (5) and the occurrence of *Lactarius* sp. was not observed in nursery conditions. However, Bonet (2) reported a regular harvest of *L. deliciosus* in young (0–5-year-old) Scotch pine plantations. The occurrence of *Lactarius* sp. on beech seedlings suggests that some taxa of *Lactarius* may exist as symbionts of young beech trees.

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