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学 位 論 文 要 約

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題目: Ectomycorrhizal fungal communities on *Dipterocarpus alatus* Roxb. Ex G. Don and their effects on seedlings

（*Dipterocarpus alatus* Roxb. Ex G. Don における外生菌根菌群集と菌根菌の苗への影響）

Dipterocarp species are the dominant canopy trees in Southeast Asian tropical forests. Because of the high demand on good quality wood, the deforestation has been increased at high rate in the last decades. Accordingly, it is no surprise why Dipterocarp trees are seriously decreased in their natural habitats. To protect the remaining tropical dipterocarp forests, rehabilitation of degraded forests with indigenous dipterocarp trees is required. Therefore, mass production of dipterocarp seedlings showing good performance is necessary for such procedures.

Dipterocarp trees have symbiotic associations with ectomycorrhizal (ECM) fungi. This symbiosis is important to enhance the growth and survival of seedlings through acquisition of soil nutrients. *Dipterocarpus alatus* Roxb. ex G. Don (Dipterocarpaceae) is a native tree species in Southeast Asian countries, but the abundance has been much decreased by illegal logging in natural forests. Therefore, reforestation with this tree species is highly recommended in Thailand. However, little is known about the identities of ECM fungi of *D. alatus* as well as their effects on the growth of seedlings. Thus, an understanding of the ECM fungal community under field conditions and evaluation of ECM fungal inoculations on the seedlings would be important for the reforestation progress.

This study examined two aspects of ECM fungi associated with *D. alatus*. The first aspect was the characterization of ECM fungal communities in both field and pot culture conditions based on morphological and molecular analyses. In field condition, the ECM fungal communities of aboveground and belowground were compared between natural forest and plantation. For pot culture condition, ECM fungal communities were investigated from seedlings inoculated with top soils collected from a natural forest and a plantation. The second aspect was the effects of ECM fungi on growth of *D. alatus* seedlings, in which three different types of inocula, i.e. soil inocula, and spore suspension and cultured mycelium of *Astraeus odoratus*, were investigated.

The ECM fungal communities of *D. alatus* were comprised of a large number of rare species and a small number of frequent species. In field condition, combining aboveground and belowground ECM fungi resulted in 82 taxa belonging to 12 families. The ECM fungal diversity in natural forests was lower than in plantations, whereas the frequent ECM fungal taxa were not different between natural forests and plantations. The top three frequent fungal genera were *Sebacina*, *Scleroderma*, Ceratobasidiaceae in the both environments. For pot culture condition, 19 taxa of ECM fungi in *Clavulina*, *Laccaria*, *Lactarius*, *Tomentella*, Pyronemataceae, and Tricholomataceae were identified. Interestingly, *Sebacina*, which was the taxon-rich fungal genus in the field, was not detected from the pot culture condition. In contrast, *Tomentella* fungi accounted for a large number of obtained sequences under both field and pot culture conditions. Accordingly, the genus *Tomentella* might have high competitive ability to colonize roots compared to other fungi, and should be promising ECM fungi for application in *D. alatus* plantation.

The inoculation of soil inocula into *D. alatus* seedlings was not only an efficient method to induce ECM formation, but also could enhance the growth of seedlings. Furthermore, the inoculation of *A. odoratus* with both inoculum types—namely, spore suspension and cultured mycelium—could increase the ECM formation and seedling growth. Consequently, it was confirmed that three different inoculation methods could enhance seedling growth, which would be useful to produce ECM seedlings of *D. alatus*.

Some issues remain to be addressed in future studies. First, the *Tomentella* fungi should be isolated into pure culture to inoculate onto dipterocarp seedlings, because it will be beneficial fungi to produce mass production of ECM seedlings. Second, the smallest required volume of soil inoculum for improving the growth of seedlings should be determined. Third, ECM seedlings should be out-planted in field conditions to confirm the effects of ECM fungi.

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