

INVESTIGATING THE ECTOMYCORRHIZAL APPEARANCE OF SEEDLINGS IN TAN PHU FOREST ENTERPRISE'S NURSERY, DONG NAI PROVINCE

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ABSTRACT: In the scope of Project "Emphasize natural forest patrimony of Dong Nai Province - Management and Enrichment of Tan Phu forest", we investigated the ectomycorrhizal appearance of seedlings in Tan Phu forest enterprise's nursery which will be mainly used to reforest in Dong Nai province. Randomly choosing and morphology analyzing 45 seedlings of 9 species of Dipterocarpaceae and Fabaceae show that 8 of 9 species have ectomycorrhiza. Only seedlings of *Dalbergia bariensis* Pierre in the nursery are not ectomycorrhizal but nodulate. This research helps to evaluate the adaptive ability of seedlings in nursery to the field conditions when they are planted in Tan Phu forest enterprise.

Key words: ectomycorrhiza (ECM), Dipterocarpaceae, Fabaceae, Hartig net, mantle extraradical hyphae

1. INTRODUCTION

Dipterocarpaceae and Fabaceae, as the families of plants, perhaps hold the distinction of being the most well-known trees in the tropical forests. They pre-dominate the international tropical timber market for ages, and therefore play an important role in the economy of many of the Southeast Asian countries (Poore, 1989). In addition, there are many types of non-wood forest products (NWFPs) from dipterocarps such as dammar, resin and camphor which have a critical impact on the economies of rural people's income.

Recently, the two families are gaining more attention, specially planting either in plantations or in poor forests. Many valuable species of these families become exhausted with every passing day because of over-logging and/or degrading. Otherwise, so many species in Fabaceae and Dipterocarpaceae have an absolutely ectomycorrhizal symbiosis which plays the critical role in the life of forest trees and influences the survived and mature ability of seedlings. Therefore, research on mycorrhizas as well as their association with dipterocarps has gained a high profile.

2. MATERIALS AND METHODS

2.1. Materials

The seedlings are collected randomly from Tan Phu forest enterprise's nursery. All of seedlings are cultivated from the seeds which are collected from the mother trees in Tan Phu forest. They are the same 2 years old and cultivated in plastic bags with the soil taken around the mother trees.

The seedlings are in nine species of two family (Fabaceae, Dipterocarpaceae): *Azelia xylocarpa* (Kurz) Craib, *Dalbergia bariensis* Pierre, *Sindora siamensis* Teysm. ex Miq. var. *siamensis*, *Dipterocarpus alatus* Roxb., *Dipterocarpus dyeri* Pierre, *Dipterocarpus turbinatus* Gaertn.f., *Hopea odorata* Roxb., *Shorea roxburghii* G. Don, *Shorea thorelii* Pierre.

2.2.Methods

The root systems of seedlings are cleared of soil with tap water (M.Brundrett et al, 1996; A.Yamada, 1996) immediately after being taken out of nursery, and then stored in alcohol. Some lengths are chosen by macro-character from the root system of every seedling and sectioned (M.Brundrett et al, 1996).

Roots are sectioned, stained by trypan blue (M.Brundrett et al, 1996) and observed the micro-morphology in light microscope Westlab II. We check about mantle, Hartig net, and the extraradical hyphae which are the special micro-characters specialized for ectomycorrhiza (Smith and Read, 1997; Peterson, 2004; Agerer, 2006). Mantle is the general character which is mainly used to check ectomycorrhiza (Peterson, 2004; Agerer, 2006).

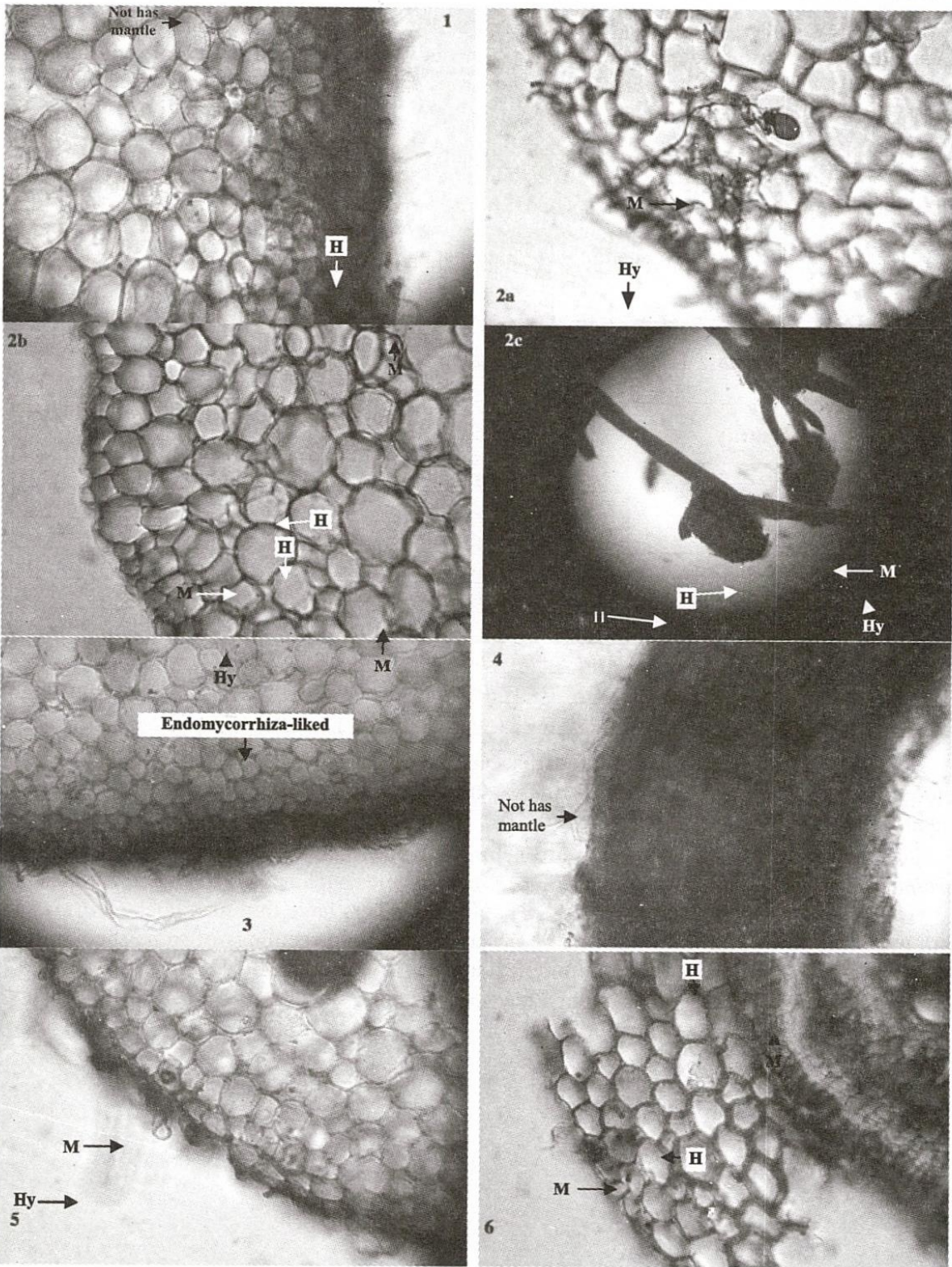
3.RESULTS

Table 1.The ectomycorrhizal appearance of seedlings

No.	Family	Species	Total	Ectomycorrhiza Appearance
1	Fabaceae	<i>Azelia xylocarpa</i>	5	5
2		<i>Dalbergia bariensis</i>	5	0
3		<i>Sindora siamensis</i>	5	5
4	Dipterocarpaceae	<i>Dipterocarpus alatus</i>	5	5
5		<i>Dipterocarpus dyeri</i>	5	5
6		<i>Dipterocarpus turbinatus</i>	5	5
7		<i>Hopea odorata</i>	5	5
8		<i>Shorea roxburghii</i>	5	5
9		<i>Shorea thorelii</i>	5	5

Seedlings of all species in Dipterocarpaceae, Fabaceae except *D. bariensis* (Fig.2b) have ectomycorrhiza. However, *D. bariensis* has a structure which is like endomycorrhiza (Fig.2a) and all of seedlings are nodulated (Fig.2c).

The mantle of all species which are ectomycorrhizal can be viewed clearly except *D. turbinatus* because of brittle sections (Fig.6). Some species such as *A. xylocarpa*, *H. odorata*, *S. roxburghii* have thick mantle (Fig.1, 7, 8) but some others have thin mantle as *D. dyeri* and *S. thorelii* (Fig.5, 9). Hartig net can not be observed clearly in seedlings of some species of *S. siamensis* and *D. dyeri* (Fig. 3, 5). Extraradical hyphae is viewed in *A. xylocarpa*, *D. alatus*, *H. odorata*, *S. roxburghii* (Fig.1, 4, 7, 8) in a few sections only.



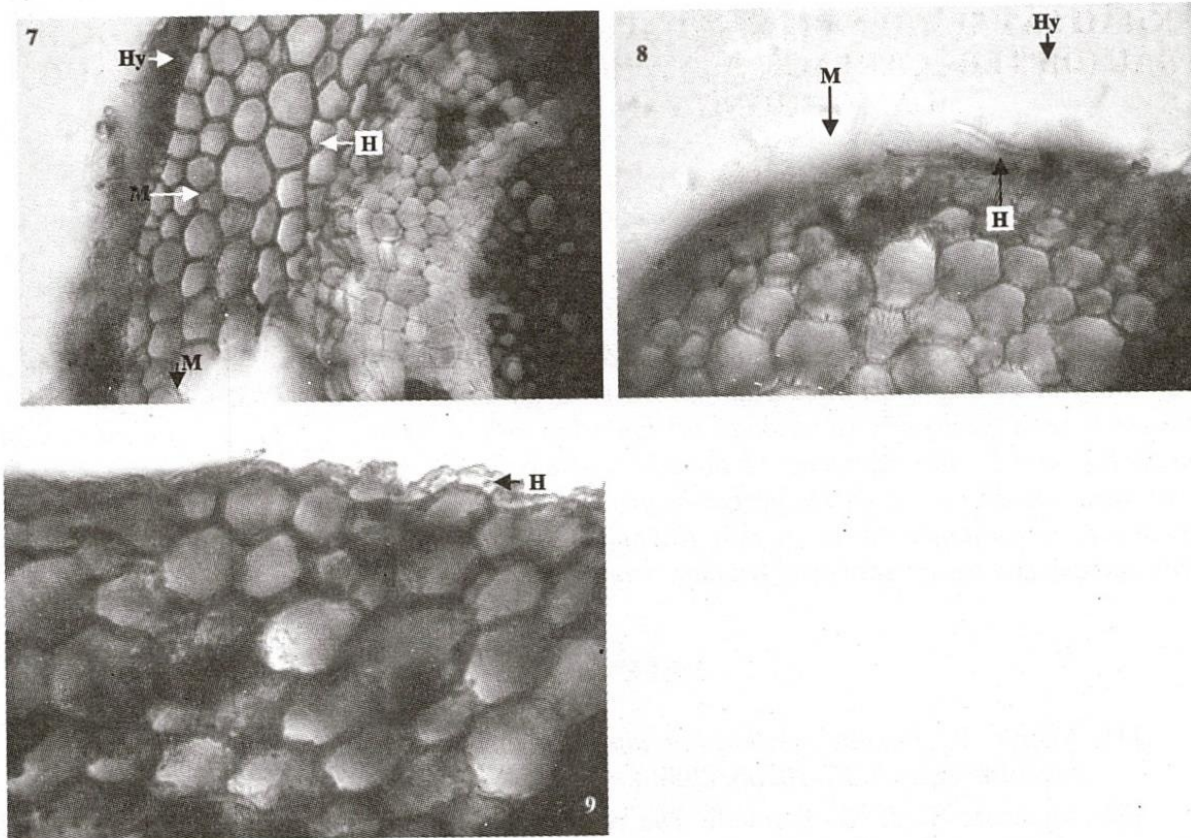


Fig. 1. *Azelia xylocarpa* Fig. 2. *Dalbergia bariensis*
 Fig. 2a. endomycorrhiza-like structure 2b. not ectomycorrhiza 2c. nodule
 Fig. 3. *Sindora siamensis* Fig. 4. *Dipterocarpus alatus* Fig. 5. *Dipterocarpus dyeri*
 Fig. 6. *Dipterocarpus turbinatus* Fig. 7. *Hopea odorata* Fig. 8. *Shorea roxburghii*
 Fig. 9. *Shorea thorelii* (M) mantle (H) Hartig net (Hy) hyphae

4. CONCLUSION

The genus *Azelia*, *Dipterocarpus*, *Hopea* and *Shorea* are recorded that having some ectomycorrhizal species (Smith and Read, 1997; Molina, Massicotte and Trape, 2002). Particularly, it has the ectomycorrhizal appeared record in *D. alatus* (Appanah, 1998), *H. odorata* (Appanah, 1998; See, 1994) and *S. roxburghii* (Appanah, 1998; Kanchanaprayudh, 2003). Therefore, the ectomycorrhizal records of *A. xylocarpa*, *D. alatus*, *D. dyeri*, *D. turbinatus*, *H. odorata*, *S. roxburghii*, *S. thorelii* in this study are corresponding with previous researches. The ectomycorrhizal appearance in *S. siamensis* is still recorded by diagnostic characters which are specified ectomycorrhiza.

The most obvious micro-character is mantle because it is the general character to investigate ectomycorrhiza of plant roots (Peterson, 2004).

All seedlings of 8 of 9 species having ectomycorrhiza in this study show that soil around mother trees has got many ectomycorrhizal germs suitable with them. Moreover, the ectomycorrhizal seedlings may have the high adaptation with field conditions of Tan Phu forest. Therefore, they have high survival ability when are planted in Tan Phu forest.

KHẢO SÁT SỰ HIỆN DIỆN NGOẠI KHUẨN CĂN Ở CÂY CON THUỘC HỌ DẦU (DIPTEROCARPACEAE) VÀ HỌ ĐẬU (FABACEAE) TẠI VƯỜN ƯƠM LÂM TRƯỜNG TÂN PHÚ, TỈNH ĐỒNG NAI

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TÓM TẮT: Trong phạm vi của dự án “Phục hồi và phát triển di sản rừng tự nhiên của tỉnh Đồng Nai - Quản lý và cải thiện rừng Tân Phú”, chúng tôi khảo sát sự hiện diện khuẩn căn ở cây con trong vườn ươm nhằm tái tạo rừng tại lâm trường Tân Phú. Chọn ngẫu nhiên tại vườn ươm, giải phẫu rễ và quan sát hình thái hiển vi và thô đại 45 cây con của 9 loài thuộc họ Dầu (Dipterocarpaceae) và họ Đậu (Fabaceae) cho thấy 8/9 loài trên có sự hiện diện của ngoại khuẩn căn. Loài *Dalbergia bariensis* tại vườn ươm không có rễ nấm nhưng qua quan sát thấy xuất hiện nốt sần rễ đậu. Kết quả của nghiên cứu hỗ trợ đánh giá khả năng thích ứng của cây con trong vườn ươm khi được trồng trong tự nhiên rừng Tân Phú.

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