

亚热带酸雨区马尾松 EM 根尖真菌群落多样性分析

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摘要:【目的】揭示亚热带酸雨区不同林型中马尾松外生菌根 (EM) 根尖的真菌群落多样性、结构和组成的差异, 探讨 EM 根尖真菌群落缓解土壤酸化的机制。【方法】以重庆铁山坪林场的马尾松纯林 (Pi)、马尾松-香樟混交林 (Pi_Ci) 以及马尾松-木荷混交林 (Pi_Sc) 为研究对象, 采用样地调查和分子生物学相结合的方法, 对不同林型中马尾松 EM 根尖的真菌群落进行研究。【结果】(1) 三种林型的马尾松 EM 根尖样品中共获得 3737 个真菌 OTUs, 隶属于 15 门 60 纲 338 科 770 属; (2) Pi 纯林 EM 根尖真菌丰富度显著高于 Pi_Sc 混交林, 三林型的 EM 根尖真菌群落多样性一致, 无显著差异; (3) 不同林型中马尾松 EM 根尖真菌群落结构组间差异显著 ($P < 0.05$), RDA 分析表明土壤中交换性 Ca、Mg 含量以及 pH 值显著影响马尾松 EM 根尖真菌群落结构; (4) Pi 纯林中主要为青霉属 *Penicillium*, 且 *Penicillium* 和 EM 真菌 *Thelephoraceae* 可能会加剧土壤酸化; Pi_Ci 混交林中有益菌占优势 (*Mortierella*、*Tausonia*、EM 真菌 *Scleroderma* 和 *Pseudotomentella*), 可改善土壤养分、缓解土壤酸化; Pi_Sc 混交林中的有益菌 *Glutinomyces* 可改善土壤环境, 但 EM 真菌 *Meliniomyces* 和 *Tomentella* 可能会加剧土壤酸化。【结论】Pi_Ci 混交林中的马尾松 EM 根尖真菌群落对缓解土壤酸化更加有益, 在亚热带重庆酸雨区种植香樟可缓解土壤酸化。

关键词: 马尾松; EM 根尖真菌; 土壤酸化; 真菌群落

Fungal community on ectomycorrhizal root tips of *Pinus massoniana* in subtropical acid rain area

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Abstract: 【Objective】 In order to reveal the differences in diversity, structure and composition of ectomycorrhiza (EM) root-tip fungal communities of *Pinus massoniana* in different forest types in subtropical acid rain area, and to explore the mechanism of EM root-tip fungal communities alleviating soil acidification. 【Method】 *P. massoniana* EM root-tips were collected from pure *P. massoniana* stands (Pi), mixed plantations with *Cinnamomum camphora* (Pi_Ci) or *Schima superba* forest (Pi_Sc), the fungal communities at the root tip of *Pinus massoniana* EM in different forest types was studied by means of sample survey and molecular biology. 【Result】 (1) A total of 3737 fungi OTUs were detected from all the samples, belonging to 15 phyla, 60 classes, 338 families and 770 genera; (2) The richness of EM root-tip fungi in Pi was significantly higher than that in Pi_Sc, while without difference in the diversity among three forest types. (3) There were significant differences in the community structure of EM root-tip fungi of *P. massoniana* ($P < 0.05$), and we also found that soil exchangeable Ca, Mg content and pH value significantly affected the community structure indicated by RDA results. (4) *Penicillium* was dominant in Pi, and *Penicillium* and the ectomycorrhizal fungus *Thelephoraceae* may aggravate soil acidification. Some beneficial bacteria (*Mortierella*, *Tausonia*, EM fungi *Scleroderma* and *Pseudotomentella*) were more abundant in Pi_Ci, which could improve soil nutrients and alleviate soil acidification. In Pi_Sc, more abundant *Glutinomyces* is

beneficial for soil environment, while EM fungi *Meliniomyces* and *Tomentella* may aggravate soil acidification.

【Conclusion】 The EM root-tip fungi of *P. massoniana* in Pi_Ci contributed to alleviate soil acidification, and plantation with *C. camphora* in Pi pure forest could alleviate soil acidification in subtropical acid rain area.

Key words: *Pinus massoniana*; EM root-tip fungi ; soil acidification; fungal community