

研究论文

# 川西亚高山带森林生态系统外生菌根的形成

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**摘要** 利用样方法于2003年8月对四川西部亚高山带分布的川滇高山栎 (*Quercus aquifolioides*)、云杉 (*Picea asperata*)、红桦 (*Betula albo-sinensis*)、山杨 (*Populus davidiana*)、铁杉 (*Tsuga chinensis*)、华山松 (*Pinus armandi*)、落叶松 (*Larix japonica*) 和冷杉 (*Abies faxoniana*) 8个主要森林类型的外生菌根进行了调查。结果表明, 所有调查的森林类型均被外生菌根真菌所侵染, 不同森林类型的宿主植物外生菌根的侵染强度不同, 同种森林类型由于受海拔高度、坡度、林龄等条件的影响, 植物的菌根侵染率、侵染强度指数以及细根生物量都发生相应的改变。高山栎林型随着海拔高度的增加, 土壤上层 (0~20cm) 菌根侵染率增高、下层 (20~40cm) 菌根侵染强度指数增大, 土壤上下层有效磷浓度都明显减少; 坡度小的云杉林型内上下两层细根生物量、菌根侵染率都高于坡度大的云杉林, 但是菌根侵染强度指数却较低; 相同立地条件下, 云杉林型在种群建立 (幼林龄) 和衰退 (成过熟林) 时菌根侵染率和侵染强度指数都显著高于种群相对稳定 (中林龄) 时期, 在养分较为肥沃的土壤环境中, 菌根侵染率、侵染强度指数与营养因子不存在明显的相关性; 山杨、落叶松、冷杉和红桦林型土壤上层菌根侵染率都超过了65%; 华山松林型由于坡度最大(50°), 其土壤上层菌根侵染强度指数也最大 (55.78%); 铁杉林型菌根形成状况最差, 但细根生物量最大。亚高山带森林类型中的上层植物细根生物量都显著高于下层, 表明植物的营养主要由上层根系所输送。

**关键词** [亚高山森林](#); [外生菌根](#); [菌根侵染率](#); [菌根侵染强度指数](#); [细根生物量](#)

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## Ectomycorrhizal infection intensity of subalpine forest ecosystems in western Sichuan, China

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**Abstract** Ectomycorrhizal infection intensity in the eight primary forests namely hollyleaf alpine oak (*Quercus aquifolioides*), China spruce (*Abies faxoniana*), chinapaper birch (*Betula albo-sinensis*), wild poplar (*Populus davidiana*), China hemlock (*Tsuga chinensis*), huashan pine (*Pinus armandi*), larch (*Larix japonica*), taxon fir (*Abies faxoniana*) in subalpine forest zone of western Sichuan China was investigated with sampling method in August 2003. The results showed that the investigated forests were all infected by ectomycorrhizae fungi. Intensity index of ectomycorrhizal infection in different forest types were different. In a homogeneous forest, the altitude, slope and forest age influenced the infection rates, infection intensity index of mycorrhizae and fine-root biomass. In the alpine oak (*Quercus aquifolioides*) forests, infection rate of mycorrhizae in upper soil layer (0—20cm) and infection intensity index of mycorrhizae in lower layer (20—40cm) increased but the concentration of available P decreased in both layers with the increase of altitude. Fine-roots biomass and infection rate of mycorrhizae in both upper and lower layers were higher, but the Mycorrhizal infection intensity index were lower in the lower-slope than the upper-slope of Chinese spruce (*Picea asperata*) forest. In the same site of China spruce forest, infection rate and infection intensity index of mycorrhizae were obviously higher at initial stage (young age) and aged stage (matured and over-matured) than at steady stage of the community. In fertile soil, Mycorrhizal infection rate and infection intensity index have no remarkable correlation with nutrient concentrations. In the wild poplar, larch, taxon fir and chinapaper birch forests infection rate

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s of mycorrhizae in upper soil layer (0—20cm were over 65%. Due to the slope of Huashan pine forest was the highest (50°), its intensity index of ectomycorrhizal infection was also the highest (55.78%). The infection rate in China hemlock forest was the lowest, but biomass of fine roots was the highest.

In subalpine forests, fine-root biomasses in upper soil layers were higher than those in lower layers, indicating that plant nutrition was mainly conveyed by upper root system.

**Key words** subalpine forest; ectomycorrhizae; infection rate of mycorrhizae; infection intensity index of mycorrhizae; fine-root biomass

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