

研究论文

不同施肥处理对丛枝菌根真菌生态分布的影响

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摘要 研究了在东北海伦实验站长期定位培肥实验地不同施肥处理下丛枝菌根 (Arbuscular Mycorrhizal, AM) 真菌生长发育状况 (包括侵染率、菌丝量和孢子数), 同时还分析了不同施肥处理下AM真菌群落生态分布和特征。结果表明施肥处理, 尤其是磷肥 (NP2K) 处理显著降低AM真菌侵染玉米根系, 而根外菌丝长度和孢子数并无显著变化, 这和施肥处理下AM真菌的种群结构发生变化有关。随着土壤肥力的增高, 土壤中AM真菌种的丰度和密度都有增加的趋势, 而当肥力增高到一定程度后 (磷肥和钾肥继续增加到NP2K和NPK2处理后), 土壤中AM真菌种的丰度和密度都有下降的趋势; 从AM真菌属在不同肥力处理下出现的频度来看, Glomus属在7个处理中出现的频度最高, 在每一个肥力处理中都有分布, Acaullospora属次之, Entrophospora属则只是出现在NK处理下; 而Glomus属中出现频度最高的种是Glomus mosseae, 其次是Glomus caledonium; 再次是Glomus diaphanum, 这说明施肥处理会影响到AM真菌种属的分布, 进而影响到AM真菌的群落结构和生态分布。

关键词 肥力; AM真菌群落; 丰度; 频度; 密度

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Effect of long-term fertilization on the diversity and distribution of arbuscular mycorrhiza fungi in Northeast China

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Abstract Arbuscular mycorrhizal fungi (AMF) are ubiquitous in terrestrial ecosystems, forming symbiotic associations with roots from the majority of plant species. In exchange for carbon from host plants, AMF colonization can facilitate plant uptake and transport of less mobile soil nutrients such as phosphorus, enhance drought tolerance and reduce pathogenic infections. However, the growth of AMF is affected by many factors including soil type, soil pH, soil moisture, soil fertility, etc. In this paper, we investigated the effects of soil fertility and long-term fertilization on the growth and diversity of AMF (including root colonization, hyphal length, spore production) under field conditions with long-term fertilization treatments in Hailun Experimental Station of Northeast China, Heilongjiang province. This long-term field experiment has been running for over 10 years. Therefore it is possible to investigate the effect of fertilization on AMF at longer time scale. Results of root colonization showed that NK treatments were beneficial to mycorrhizal formation. High fertilization level, particularly phosphorus (treatment NP2K) inhibited the growth of AMF. Root colonization is one of the key factors affecting the growth of external hyphae and the production of spores in the soil. The higher root colonization with NK treatments produced longer external hyphae. However, higher spore numbers were not observed in NK treatments. This may be partly attributed to the difference in ecological distribution and characteristics of the community of AMF infl

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uenced by different fertilization treatments. The species richness and density tended to increase with the increase in soil fertility, while higher fertility (NP2K and NPK2) was not associated with higher species richness and density in the soil. AMF with the highest frequency was found to be in the genus of *Glomus* among the four fertilization treatments, *Acaulospora* had the second highest frequency, and *Entrophospora* appeared only in NK treatment. The highest frequency genus of AMF in all treatments was *Glomus*, species with the highest frequency, such as *Glomus mosseae*, *Glomus caledonium*, *Glomus diaphanum*, were also the genus in *Glomus*. These results suggested that the community and population of AMF was affected by soil fertility. The soil fertility was then affected the community and ecological distribution of AMF. Among the different species of AMF, *Glomus mosseae* was the most popular species and had the highest tolerance to the high soil fertility. The results of this investigation indicated that *Glomus mosseae* was the isolate which had a wide adaptation to a wide range of soil fertility.

Key words [fertility](#); [AMF](#) [community](#); [species](#) [richness](#); [frequency](#) [and](#) [density](#)

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