

丛枝菌根对芘污染土壤修复及植物吸收的影响

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Impacts of arbuscular mycorrhizae on plant uptake and phytoremediation of pyrene in soils

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摘要

采用温室盆栽试验方法, 研究了两种丛枝菌根真菌 *Glomus mosseae* 和 *Glomus etunicatum* 对三叶草 (*Trifolium subterraneum* L.) 和辣椒 (*Capsicum annuum* L.) 修复芘污染土壤的影响。供试土样中芘初始浓度为 0 ~ 75.18 mg/kg。结果表明, 接种 AMF 可促进供试植物对土壤中芘的吸收, 并且显著提高三叶草根的芘含量、根系富集系数、根和茎叶的芘积累量, 但对辣椒根和茎叶芘含量、根系富集系数的影响不显著, 这主要与植物的菌根侵染率和“菌根依赖性”不同有关。接种 AMF 土壤中芘的削减率高于普通植物修复, 但植物吸收积累对修复的贡献率小于 0.2%; 因此推测, AM 作用下良好的根际环境对土壤微生物数量和活性的提高、进而对土壤中芘降解的促进可能是菌根修复的主要机理。

关键词: 丛枝菌根 多环芳烃 植物吸收 土壤 菌根修复 丛枝菌根 多环芳烃 植物吸收 土壤 菌根修复

Abstract:

Uptake of pyrene from soils by clover (*Trifolium subterraneum* L.) and capsicum (*Capsicum annuum* L.) in the presence of arbuscular mycorrhizae (AM) fungi was investigated using a greenhouse study. The impacts of AM on phytoremediation of soil pyrene contaminant were also elucidated. Two arbuscular mycorrhizal fungi (AMF) including *Glomus mosseae* and *Glomus etunicatum* were experimented. The initial concentrations of pyrene in soils were 0–75.18 mg/kg. In 60 days, inoculation of AMF significantly enhanced the uptake of pyrene by clover from soils basing on the root concentrations, root concentration factors, and accumulated amounts of pyrene in root and shoot. However, no significant influence was observed for the inoculation of AMF on the uptake of pyrene by capsicum. This would be the results from the weaker mycorrhizal infection rate and Mycorrhizal Dependence (MD) for capsicum. Compared with phytoremediation, arbuscular mycorrhizal remediation (AMR) was more efficiency on soil pyrene contaminant reduction. In 60 days, 67.80%–92.40% of pyrene was degraded for AMR process. However, the accumulated amounts of pyrene by tested plants contributed less than 0.2% to the total degradation of pyrene in soils. In contrast, the enhanced microbial activities and consequently the increase of microbial degradation of pyrene in soils in the presence of AM should be the predominant mechanisms of AM bioremediation for soil pyrene contamination.

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