

长期施肥对黄棕壤性水稻土氨氧化细菌多样性的影响

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Effects of long-term fertilization on ammonium oxidizing bacterial diversity in a paddy soil derived from yellow-brown earth

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摘要

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摘要 以湖北省农科院长期施肥试验站的黄棕壤性水稻土为研究对象, 采用PCR-DGGE方法, 研究了氮肥(N)、氮磷(NP)、氮磷钾(NPK)、有机肥(M)、有机肥+氮磷钾(MNPK)长期施用对土壤氨氧化细菌遗传多样性的影响。结果表明, 与长期不施肥处理(CK)相比, 长期施肥提高了黄棕壤性水稻土有机质、全氮、微生物量碳氮(SMB-C、SMB-N)含量, 并改变了氨氧化细菌的群落结构。其中有机肥与化肥长期配施下氨氧化细菌的多样性高于化肥处理。氨氧化细菌聚类分析表明, 稻麦收获后土壤氨氧化细菌DGGE图谱分别聚为一个族群; 同一作物收获后, M和MNPK聚为一类, N、NP、NPK和CK聚为一类, 后者内部分类在两季作物间有差别。DGGE指纹图谱条带序列分析表明, 供试土壤的优势氨氧化细菌为 β -变形菌纲的亚硝化单胞菌和亚硝化螺旋菌。

关键词: 长期施肥 水稻土 微生物量碳氮 氨氧化细菌 PCR-DGGE

Abstract: Effects of long-term application of N, NP, NPK, M (pig manure), and MNPK (pig manure plus NPK) on soil microbial carbon (SMB-C), soil microbial nitrogen (SMB-N), and ammonium oxidizing bacterial (AOB) diversity in a paddy soil derived from yellow-brown earth in Hubei Academy of Agricultural Sciences were studied. Results showed that, all fertilizer treatments tended to increase soil organic matter, total N, SMB-C (N), and alter the AOB community compared with the control. Among the six treatments, MNPK acquired more complex AOB community structure than those of chemical fertilizers application only. Unweighted Pair Group Method Clustering (UPGMC) analysis of the DGGE banding patterns showed that, treatments harvesting rice and wheat were divided to two classes respectively. After the same crop harvested, all treatments were divided to two classes. M and MNPK were grouped into one class, and N, NP, NPK and CK were clustered into the other. And there were difference between rice and wheat harvested in the latter class. Sequence analysis of prominent bands in DGGE profiles showed that Nitrosospira and Nitrosomonas within β -proteobacteria were the dominant ammonium oxidizing bacteria in studied soil.

Keywords: long-term fertilization paddy soil SMB-C(N) AOB PCR-DGGE

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