

研究报告

长期重金属胁迫对农田土壤微生物生物量、活性和种群的影响

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摘要 调查了沈阳张士灌区长期污水灌溉造成的原位农田土壤重金属污染状况, 从土壤微生物生物量、微生物活性和微生物种群数量的角度评价了长期重金属污染对农田土壤生态系统的影响. 结果表明, 张士灌区土壤存在严重的Cd污染, 土壤Cd含量达1.75~3.89 mg·kg⁻¹, 部分区域还伴有Cu、Zn复合污染. 在目前污染程度下, 土壤微生物生物量碳(C_{mic})、微生物商(qM)、土壤脱氢酶活性以及自生固氮菌数量随土壤重金属含量增加呈下降趋势, 代谢商(qCO₂)随土壤重金属含量增加显著升高, 而底物诱导呼吸强度(SIR)、纤维素酶活性以及细菌、放线菌和真菌数量无明显变化. 相关性分析表明, 土壤Cd含量变化是影响微生物参数变化的主要因素, 在微生物参数中微生物商和代谢商对重金属污染最敏感.

关键词 [重金属污染](#) [农田土壤](#) [土壤微生物](#)

分类号

Effects of long term heavy metals stress on farmland soil microbial population, biomass and activity.

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Abstract

An in situ investigation on the farmland soil heavy metals pollution caused by long-term irrigation with heavy metals containing wastewater was carried out in the Zhangshi Irrigation Area of Shenyang. The indices soil microbial population, biomass, and activity were used to evaluate the effects of long-term heavy metals pollution on farmland soil ecosystem. The results showed that in Zhangshi Irrigation Area, soils were heavily polluted by cadmium, with the cadmium content ranged from 1.75 to 3.89 mg·kg⁻¹, and parts of them were co-contaminated by cadmium, copper and zinc. At the present pollution level, the increased soil heavy metals content resulted in a substantial decrease in soil free-living nitrogen fixing bacteria, microbial biomass carbon (C_{mic}), microbial quotient (qM) and dehydrogenase activity, and a significant increase of metabolic quotient (qCO₂). No significant changes were observed in soil bacteria, actinomyces, fungi, and substrate-induced respiration (SIR). Correlation analysis showed that the changes of soil microbial parameters were mainly caused by soil cadmium pollution. Comparing with other test microbial parameters, microbial quotient and metabolic quotient were more sensitive to soil heavy metals pollution.

Key words [heavy metals pollution](#) [farmland](#) [soil microbes](#)

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