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LEAD WITH ACCUMULATED POLLUTION MODEL AFFECTED MICROBIAL ACTIVITY AND FUNCTIONAL DIVERSITY IN TEA GARDEN SOIL OF ANHUI PROVINCE, CHINA

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Abstract

This study aimed to evaluate the effects of an accumulated lead pollution model on the structure and metabolic functions of culturable soil microorganisms, as well as and their mechanisms of adaptation to lead contamination. The research employed the dilution plate culture method and the Biology EcoPlate method to investigate culturable microorganisms. The results indicated that, in comparison to soil exposed to a single instance of contamination, soil subjected to multiple exposures exhibited higher levels of culturable microbial activity. The total carbon sources utilized by culturable microorganisms increased with the concentration of lead pollution. Fungi demonstrated a greater resilience to relatively high lead pollution, while certain bacteria exhibited tolerance to high concentrations of lead. Conversely, actinomycetes populations declined with increasing pollution concentration, being significantly higher in soils with accumulated pollution (2.71-3.75 $\times 10^{\wedge 5}$/g) than in soils with single instance pollution (0.80-2.49 $\times 10^{\wedge 5}$/g). Soil respiration decreased as lead pollution concentration rose, from 17.33 mg/g/h to 4.85 mg/g/h. The accumulated pollution model resulted in a greater increase in soil organic carbon (12.63-12.67 g/kg) and microbial biomass carbon (64.13-73.38 mg/kg) compared to the single-instance pollution model (11.91-11.96 g/kg and 47.58-61.61 mg/kg). The highest levels of microbial biomass C were observed in high lead treatments under both pollution models. For the same lead concentration, the accumulated contamination model yielded a higher McIntosh index. This study utilized the accumulated lead pollution model to simulate the gradual accumulation of lead in real-world soil conditions, demonstrating higher levels of culturable microbial activity in tea garden soil and indicating its potential for more accurately assessing lead risks in actual soil environments.

Key words: accumulated pollution model**,** functional diversity, lead**,** single-instance pollution model**,** soil microorganisms

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