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研究论文

西双版纳热带雨林凋落叶分解过程Ⅱ.微生物与线虫的群落动态

张瑞清[1,2],孙振钧[1,*],王冲[1],葛源[1],乔玉辉[1],庞军柱[1],袁堂玉[2]

1.中国农业大学资源与环境学院，北京100094
2.山东省烟台市农业科学研究院，烟台 265500

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摘要 通过野外试验与室内模拟相结合，对西双版纳热带雨林生态系统混合凋落叶分解过程中微生物和线虫种群动态变化进行了系统研究。野外试验采用网袋法（即1 mm和100 μm网眼网袋，分别限制大型土壤动物和螨类的进入），室内试验采用灭菌-接种法，以观测不同生物组成条件下线虫和微生物对凋落叶的分解作用。结果表明，伴随分解进程，微生物基本呼吸速率不断下降且与分解进程正相关。利用底物诱导呼吸法测定微生物生物量以及细菌、真菌生物量的变化表明，微生物在凋落叶分解过程中的演替遵循一定的路线。当土壤动物参与分解时，由于捕食压力的存在，微生物一般按照“双峰”型路线变化，并存在明显的生物演替现象，在这个过程中微生物对C的利用效率也不断提高；当不存在这种捕食压力时，微生物表现为“单峰-递减”式发展模式，生物量由强到弱变化，微生物对C的利用效率持续下降。土壤动物在凋落叶分解过程中表现为“单峰”型变化动态，与微生物量“双峰”动态形成互补，捕食者与被捕食者之间是一种“捕食-激发”作用下的种群消长关系，这种关系的强烈程度与捕食压力有关。“双峰”发展路线在一定程度上加速了凋落叶的分解进程。

关键词 西双版纳 _ 热带雨林 _ 混合凋落叶 _ 微生物 _ 线虫 _ 群落动态 _ 生物演替

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Eco-process of leaf litter decomposition in Xishuangbanna tropical rainforest, Southwest China Ⅱ.Population dynamics of soil microbiota and nematodes

ZHANG Rui-Qing[1,2],SUN Zhen-Jun[1,*],WANG Chong[1],GE Yuan[1],QIAO Yu-Hui[1],PANG Jun-Zhu[1],YUAN Tang-Yu[2]

1 College of Resources and Environmental Sciences, China Agricultural University, Beijing 100094, China
2 Yantai Academy of Agricultural Sciences, Yantai 265500, China

Abstract Population dynamics of soil microbiota and nematodes during decomposition process of mixed leaf litters were investigated based on field study in Xishuangbanna tropic rainforest and simulated investigation indoors. We designed litterbags with coarse mesh size of 1 mm and fine mesh size of 100 μm to restrict access by most soil macrofauna and mites, respectively, to estimate the effects of different soil fauna components on litter decomposition. In the indoors experiment, sterilization and inoculation were adopted to investigate the different effects of nematodes and microbiota on leaf litters. The results showed that microbial basal respiration declined during decomposition and positively correlated with the decay rate. The dynamics of microbial biomass and bacterial and fungal biomass measured from substrate-induced respiration (SIR) kept to some succession route during litter decay. Commonly, the dynamic of microbial community followed “double peak” route and presented distinct succession trend with gradually improvement of the carbon utilization of microbe, when prey stress of soil fauna that participated in the decay process existed. Otherwise, microbial community conformed to “single peak-decadency” dynamic model, microbial biomass decreased sequentially and the carbon utilization of microbe declined as well as no prey stress occurring. On contrary to microbial “double peak” dynamic model, the development of soil fauna accorded to “single peak” pattern. The preyor and preyed had some ebb and flow connection between under “prey- excitation” effect which related to the intension of prey stress. “Double peak” dynamic model of microbe accelerated the decay process in some extent.

Key words Xishuangbanna _ tropic rainforest _ mixed leaf litter _ microbiote _ nematode _ population dynamic _ biological succession

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通讯作者 孙振钧 sun108@cau.edu.cn