

研究论文

不同土壤培肥措施下农田有机物分解的生态过程

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摘要 通过在河北曲周实验站的田间试验, 研究了4种不同土壤培肥措施条件下农田生态系统中几种主要土壤生物随有机物分解的变化规律、有机物的分解及其主要影响因素。研究表明: 除土壤线虫外, 其他几种主要的土壤生物分布规律基本上是堆肥区>原貌区>对照区>化肥区, 与施入的有机物(小麦秸秆)的分解规律一致。在受人为扰动的堆肥区、化肥区和对照区土壤中, 细菌占绝对优势, 而在未开垦的原貌区中, 真菌起着重要作用。

在有机物分解初期, 土壤微生物能比较快地迁移到秸秆表面, 秸秆表面的生物数量最多的是细菌, 随着细菌的数量增加, 原生动物的数量亦呈现增加趋势, 蚯蚓数量增多, 而线虫的数量则减少。而有机物分解后期, 真菌的数量逐渐减少, 蚯蚓的数量也呈下降趋势, 有机物的分解速度减慢。通过灰色关联度分析, 9种外界因素(生物因素和环境因素)对小麦秸秆分解作用的相对重要程度排序: 土壤温度(0.844)>蚯蚓(0.777)>真菌(0.764)>全氮(0.754)>线虫(0.753)>有机质(0.742)>细菌(0.738)>原生动物(0.693)>土壤含水量(0.661), 其中土壤温度和蚯蚓是影响土壤有机物分解的最重要的两个因素。

关键词 [农田](#); [有机物分解](#); [土壤生物](#); [生态过程](#)

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The eco-process of agricultural organic matter decomposition under different soil conditions

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Abstract The decomposition of organic matter and the succession of different soil fauna population during this process were studied under four different soil fertility maintaining treatments at Quzhou experimental Station of Hebei Province. The results showed that the numbers of some main soil fauna—excluding nematodes—differed between treatments with the highest number in the compost plot (OF followed by the untilled plot (OR) and the control plot (CK) with the lowest number in the chemical fertilization plot (CF). This trend was in accord with the trend of decomposition rate in the different treatments. In the compost plot, the control plot and the chemical fertilization plot, bacterial-based food webs play the main role in regulating organic matter decomposition. Contrary to this, fungal-based food web plays a larger role in regulating organic matter decomposition in the untilled plot.

At the initial stage of the decomposition, the biomass of bacteria was greater, the number of protozoa increased, and so did the number of earthworms under all treatments. At the late decomposition stage, the biomass of fungi and the number of earthworms decreased, which was correlated with a decreasing decomposition rate. Gray correlation analysis was used to study the relationship between the organic matter decomposition rate and environmental or biological factors. The most important regulating factors in descending sequence were Soil temperature (0.844), Number of earthworms (0.777), fungi (0.764), total nitrogen (0.754), Numbers of nematodes (0.753), Soil organic matter (0.742), Numbers of bacteria (0.738), protozoa (0.693) and soil moisture (0.661), Therefore, soil temperature and the number of earthworms were the main factors that affected the organic matter decomposition rates.

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