

研究论文

长期不同施肥下太湖地区黄泥土蚯蚓的多样性、蛋白质含量与氨基酸组成的变化

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摘要 水稻土在不同施肥管理下的土壤质量及其生态系统功能的变化是当前土壤学和农业生态学的关注领域。对太湖地区一个15a的长期不同施肥处理下稻田进行了蚯蚓群落的调查采样,并测定了蚯蚓蛋白质含量和氨基酸组成。供试水稻土中共检出7种蚯蚓。长期不同施肥措施影响了蚯蚓的群落结构,单施化肥下农田蚯蚓的种类和数量明显减少,多样性指数和丰富度明显降低,且蚯蚓总氨基酸的含量和大部分种类氨基酸含量降低,同时蚯蚓中分子量小于25kd的蛋白质含量降低,而分子量33kd附近的蛋白质含量明显增加;相反,长期化肥配合秸秆还田和配施猪粪趋向于提高蚯蚓蛋白质含量或氨基酸含量。看来,农田中蚯蚓不但在种群变化上,而且在体内生命活性物质组成上均响应稻田不同施肥措施下的土壤环境变化。

关键词 [长期试验](#) [蚯蚓](#) [氨基酸和蛋白质](#) [水稻土](#) [施肥措施](#) [生物多样性](#)

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Changes in diversity, protein content and amino acid composition of earthworms from a paddy soil under long-term different fertilizations in the Tai Lake Region, China

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Abstract Influence of the agricultural management practices on soil quality and the ecosystem functions has been an increasing concern in soil science and ecology with sustainable agriculture. This study deals with the soil earthworm community changes under different fertilization schemes in a paddy soil under long-term different fertilizations. The studied soil is located in Wujiang Municipality, Jiangsu Province, China and had been cultivated under rice-rapeseed rotation since 1987. The treatments are as follows: no fertilizer application (NF); chemical fertilizer only (CF); chemical fertilizer plus rice straw return (CSF) and chemical fertilizer plus pig manure (CMF). The amount of chemical fertilizer per year is N as urea 28.5 kg/hm², P₂O₅ as super phosphate 3.0kg/hm², KCl 5.6 kg/hm² and that of rice straw return is 300 kg FW/hm² and of manure 1120 kg FW/hm² respectively. The soil earthworms were collected and counted in the field from different fertilizer treated plots after rapeseed harvest in May 2004, and their taxonomic groups examined under binocular stereoscope at laboratory. The earthworm body was crashed and protein separated by cell crusher, and the protein molecules with different sizes were analyzed by electrophoresis. Furthermore, another portion of earthworms collected was hydrolyzed and the aliquots were subjected to amino acid auto-analyzer. The results showed that totally 7 species of earthworms were recognized in the paddy field with the number varying with different fertilization treatments. The earthworm

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m community structure was much affected by the fertilization practice. Under chemical fertilization only, both number of earthworm species and quantity of individuals were significantly smaller than under the other treatments. Furthermore, there was an obvious decrease in the total amino acid and contents of most amino acids of the earthworms under chemical fertilization only compared to those under combined fertilization of chemical and organic fertilizers. Whereas, chemical fertilizers in combination with rice straw return increased earthworm amino acid content, while long term pig manure application tended to increase earthworm protein content. As a molecular footprint, long-term chemical fertilization caused reduction of the content of protein with MW less than 25 kd but significant increase in that of protein with molecule size around 33 kd. This study demonstrated that different fertilization affect not only earthworm population but also diversity and richness in the paddy soil after 16 years of treatment and that long term chemical fertilization may impact soil fauna community and thus, influence the paddy ecosystem functioning as of yield stability. This study implicated also that not only the community structure but also the amino acid metabolism as life functioning of earthworm in cropland soils may pose significant responses to the agricultural management practices.

Key words long term trial soil earthworm amino acid and protein paddy soil biodiversity fertilization

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