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研究论文

干旱、半干旱区土壤蚯蚓稳定性碳同位素组成与轮作模式的关系

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摘要 对10个不同耕地生境中蚯蚓（Lumbricus terrestris）的稳定性碳同位素进行了分析，研究了豫西洛阳干旱、半干旱地区土地轮作模式和耕作历史。结果表明，耕地表层土壤（0~30cm）中蚯蚓的δ13C介于-18.3‰和-25.6‰间，变化幅度较大。经稳定性同位素质量平衡模式计算，10个生境中蚯蚓取食C3 作物的比例在40.1%和99.4%之间波动，蚯蚓的取食生态受到土地上C3/C4 作物轮作模式的影响。C4作物轮作频率与蚯蚓稳定性碳同位素比值之间呈正相关。土壤动物的稳定性碳同位素比值可较客观地反映出耕作制度和轮作模式。

关键词 稳定性碳同位素；蚯蚓；轮作模式；C3 植物；C4植物

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Stable carbon isotopes of earthworms to reveal dominant C3 and C4 crop sources and different crop rotation systems in arid and semi-arid areas

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Abstract Stable carbon isotopes of earthworms in ten different habitats were analyzed to reveal crop rotation history in arid areas, Luoyang, Henan Province, China. The results of the present study indicated that δ13C values of earthworms ranged from -18.3‰ to -25.6‰ and show great variations. Based on the mass balance theory of stable isotopes, the distribution percentages of C3 crops incorporated into earthworms′ diets are ranged from 40.%1 to 99.4%, respectively in the ten different habitats. The above data suggest that digested diets of earthworms are dependent on different C3/C4 crop rotation model. We found a close correlation between C4 crop percentage revealed from δ13C values of earthworms and rotation frequencies by C4 corns based on the oral interview with farmers. δ13C values of earthworms basically reflected the carbon isotopes of winter wheat in habitats never undergoing rotation by corn in recent 10 years. However, δ13C values of earthworms become significantly less negative in habitats where alternative rotation by corn in recent 10 years. It seemed that δ13C of earthworms actually reflected cropping system in the research habitats.

Key words stable carbon isotope earthworm rotation system C3 crop C4 crop

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