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研究报告

洞庭湖湿地土壤碳、氮、磷及其与土壤物理性状的关系

彭佩钦[1，2] 张文菊[2，3] 童成立[2] 仇少君[1，2] 张文超[1，2]

[1]湖南农业大学资源环境学院,长沙 410128;[2]中国科学院亚热带农业生态研究所亚热带农业生态重点实验室,长沙 410125；[3]华中农业大学资源环境学院,武汉 430070

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摘要 以洞庭湖3类典型湿地的8个土壤剖面为代表,研究了土壤碳、氮、磷,微生物量碳、氮、磷和土壤物理性状的分布特征.结果表明，土壤表层有机碳含量为19.63～50.20 g·kg^{-1},微生物量碳为424.63～1 597.36 mg·kg^{-1},微生物量碳占有机碳的比例为3.17%～4.82%;土壤表层全氮1.85～4.45 g·kg^{-1},微生物量氮57.90～259.47 mg·kg^{-1},微生物量氮占全氮的比例3.13%～6.42%;土壤表层微生物量磷含量顺序为：湖草洲滩地(200.99 mg·kg^{-1})>垦殖水田(163.27 mg·kg^{-1})>芦苇洲滩地(24.16 mg·kg^{-1}),微生物量磷占全磷的比例为1.09%～11.20%；土壤表层容重0.65～1.04 g·cm^{-3}；土壤表层粘粒(<0.001 mm)26.24%～39.48%.土壤表层有机碳、全氮、微生物量氮、微生物量磷的含量,湖草洲滩地>垦殖水田>芦苇洲滩地.土壤表层微生物量碳,垦殖水田和湖草洲滩地接近,而大于芦苇湿地；土壤表层容重,芦苇洲滩地>垦殖水田>湖草洲滩地；土壤表层<0.01 mm、<0.001 mm粘粒,湖草洲滩地、芦苇洲滩地>垦殖水田.湿地土壤剖面中有机碳、微生物量碳、全氮、微生物量氮、微生物量磷、容重以及微生物量碳占有机碳的比例、微生物量氮占全氮的比例、微生物量磷占全磷的比例均随深度的增加而降低,至一定深度稳定,而土壤全磷在剖面上下的差异很小.湿地土壤微生物量碳、氮、磷之间呈极显著的正相关关系；土壤容重与有机碳、全氮、微生物量碳、氮、磷之间呈极显著指数负相关关系.湿地土壤<0.001 mm粘粒与有机碳、全氮、微生物量碳、氮、磷含量呈极显著对数正相关关系.

关键词 湿地,土壤微生物量碳氮磷,容重,粘粒,土壤剖面

分类号

Soil C,N and P contents and their relationships with soil physical properties in wetlands of Dongting Lake floodplain

PENG Peiqin [1,2],ZHANG Wenju [2,3],TONG Chengli [2],QIU Shaojun [1,2],ZHANG Wenchao [1,2]

[1]College of Resource and Environment,Hunan Agricultural University, Changsha 410128,China;[2]Key Laboratory of Subtropical Agro－ecology, Institute of Subtropical Agriculture,Chinese Academy of Sciences,Changsha 410125,China;[3]College of Resource and Environment,Huazhong Agricultural University,Wuhan 430070,China

Abstract

Eight representative soil profiles were installed on three types of wetland (two profiles on Carex spp.-dominated floodplain,four on Phragmites-dominated floodplain, and two on paddy soil) in Dongting Lake floodplain of China in 2004,and their C,N and P contents,microbial biomass C,N and P,<0.001 mm clay particles,and bulk density were measured.The results indicated the spatial distribution of soil C and N and soil microbial biomass C,N,and P were very similar in the profiles (0～100 cm) of three types of wetland,being decreased gradually with depth,except for soil TP which was constant in the profiles.The percentages of soil microbial biomass C,N and P to soil organic C,total nitrogen and total phosphorus decreased gradually with depth.In top layer (0～10 cm),the contents of soil organic C and microbial biomass C and the percentage of soil microbial biomass C to organic C were 19.63～50.20 g·kg^{-1},424.63～1 597.36 mg·kg^{-1},and 3.17%～4.82%,respectively,the contents of soil total N and microbial biomass N and the percentage of soil microbial biomass N to total N were 1.85～

4.45 g·kg^{-1}, 57.90～259.47 mg·kg^{-1},and 3.13%～6.42%,respectively,and the content of soil microbial biomass P and the percentage of soil microbial biomass P to soil total P was 24.16～200.99 mg·kg^{-1} and 1.09%～11.20%,respectively. The bulk density of soil top layer (0～10 cm) was 0.65～1.04 g·cm^{-3},and the content of <0.001 mm clay particles was 26.24%～39.48%.The contents of soil organic C and N and microbial biomass N and P in 0～10 cm layer were the highest in Carex spp.-dominated floodplain,followed by paddy soil,and Phragmites-dominated floodplain.Also in 0～10 cm layer,the soil microbial biomass C in Carex spp.-dominated floodplain and paddy soil was higher than that in Phragmites-dominated floodplain,while the soil bulk density in Phragmites-dominated floodplain was higher than that in paddy soil,and much higher than that in Carex spp.-dominated floodplain.The amount of soil <0.001 mm clay particles in Carex spp.-dominated floodplain and Phragmites-dominated floodplain was higher than that in paddy soil.In these three types of wetland,soil organic C and N and microbial biomass C,N and P had a significant logarithm correlation (P<0.01) with <0.001 mm clay particles,and a significant index correlation (P<0.01) with bulk density.

Key words Wetland Soil microbial biomass C N and P Bulk density Soil clay granule Profiles

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通讯作者