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长期施肥下灰漠土有机碳组分含量及其演变特征

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Evolution characteristics of organic carbon fractions in gray desert soil under long-term fertilization

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摘要 采用湿筛和重液悬浮的物理分组方法分析了18年不同施肥模式下灰漠土有机碳组分含量差异及其演变特征。结果表明：与不施肥相比，长期有机无机肥配施（NPKM和1.5 NPKM）增加各有机碳组分的效果最显著，且粗和细自由颗粒有机碳、物理保护有机碳、矿物结合有机碳增加速率最高，平均分别达到0.12、0.06、0.08及0.17 g/(kg·a)；秸秆还田使粗和细自由颗粒有机碳分别以0.05和0.03 g/(kg·a)的速率增加，而撂荒和施化肥维持着各有机碳组分的含量。不同有机碳组分间存在显著的相关性，其中以粗自由颗粒有机碳含量增幅最高，不同施肥模式下平均增幅是其它有机碳组分的2.1～8.0倍；以矿物结合有机碳所占比例最高，达到56.9%～77.8%，说明粗自由颗粒有机碳对施肥较敏感，而矿物结合有机碳是灰漠土固存有机碳的主要形式。综上分析，长期有机无机肥配施是提高灰漠土有机碳组分含量和培肥土壤的有效模式。

关键词： 长期施肥 灰漠土 有机碳组分 演变特征

Abstract： The wet sieving and density fractionation scheme was used to study the content and evolution characteristics of organic carbon fractions in grey desert soil under 18 years' fertilization. The results showed that, compared with CK, manure combined with inorganic fertilizer（NPKM and 1.5 NPKM）was most effective on the increase the all organic carbon fractions, and also kept them in the highest increase rate. The average increase rate in coarse free particalate organic carbon(cfPOC) was 0.12 g/(kg·a), in fine free particulate organic carbon(ffPOC) was 0.06 g/(kg·a), in intra-microaggregate particulate organic carbon(iPOC) was 0.08 g/(kg·a)and in mineral-associated organic carbon(MOC) was 0.17 g/(kg·a), respectively. Straws return also increased cfPOC and ffPOC by 0.05 and 0.03 g/(kg·a)respectively. The treatment of abandonment(CK0)and chemical fertilizer maintained the organic carbon content in all fractions. There was a significantly positive relationship between the different organic carbon fractions. The cfPOC under long term fertilization was increased higher than other organic carbon fraction by 2.1～8.0 times, which implied cfPOC was more sensitive to the fertilizations. The MOC, accounting for 56.9%～77.8% of total organic carbon(TOC), was main form for organic carbon sequestration in grey desert soil. In a word, long-term manure combined with chemical fertilizers was benefit to enhance content of organic carbon fractions and improve fertility of gray desert soil.

Keywords： long-term fertilization gray desert soil organic carbon fractions evolution characteristic

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