

不同地表覆盖栽培对旱地土壤有机碳、无机碳和轻质有机碳的影响

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Effects of soil-surface mulching on organic carbon, inorganic carbon and light fraction organic carbon in dryland soil

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摘要

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摘要 通过田间长期定位试验, 分层采集冬小麦-休闲种植体系0—40 cm土层的土样, 研究了常规、地表覆膜和覆草栽培对土壤有机碳、无机碳和轻质有机碳的影响。结果表明, 覆膜或覆草可以显著增加地上部小麦生物量和子粒产量。不同地表覆盖对0—40 cm土层的无机碳含量和分布无显著影响, 但与常规栽培相比, 地表覆膜使0—5 cm土层的有机碳含量显著降低, 0—40 cm各土层轻质有机碳表现出明显降低趋势, 平均降低 C 6.1~74.5 mg/kg; 地表覆草却表现出明显增加土壤轻质有机碳的趋势, 0—5, 5—10, 10—20 cm土层的轻质有机碳含量分别增加C 235.2、190.0和144.9 mg/kg, 相当于常规的38.7%, 32.9%和34.5%。同时, 覆草栽培还表现出降低0—10 cm土层轻质有机质含碳量的趋势, 并使0—20 cm土层轻质有机碳占有机碳的比例显著高于常规栽培和地表覆膜处理。可见, 地表长期覆膜不利于旱地土壤有机碳累积, 覆草不仅可以增加表层土壤的轻质有机碳累积, 还可改善土壤碳氮组成。

关键词: 覆盖栽培 旱地土壤 有机碳 无机碳 轻质有机碳 覆盖栽培 旱地土壤 有机碳 无机碳 轻质有机碳

Abstract: To sustain the balance of soil carbon pool, decrease output of soil organic carbon and increase soil labile organic matters have been proved playing an important role in enhancing soil fertility. Long-term field experiments have been carried out with winter wheat and fallow rotation system since 2002, and soil samples were taken from 0-40 cm soil layers to study the effects of conventional tillage (CT), plastic-film mulching (PM) and wheat straw mulching (SM) on soil organic carbon (SOC), inorganic carbon and light fraction organic carbon (LFOC). The results showed that PM or SM increased significantly biomass and grain yield. Different soil surface mulching had no significant effects on soil inorganic carbon contents and its distribution in 0-40 cm soil layers. PM treatment significantly decreased SOC contents in 0-5 cm soil layer, but decreased LFOC by C 6.1~74.5 mg/kg compared to CT in 0-40 cm soil layers. In contrast, wheat straw mulching significantly increased LFOC in 0-5, 5-10 and 10-20 cm soil layers by C 235.2, 190.0 and 144.9 mg/kg, respectively. In the mean time, SM also tend to decrease the carbon content in light fraction organic matter (LFOM) in 0-10 cm soil layers and increase the proportions of LFOC to SOC in 0-20 cm soil layers compared to the CT as well as PM. This indicates that long-term soil surface mulching with plastic film was not profit for organic carbon accumulation in dryland soil. Mulching soil surface with crop straw not only enhances the soil light fraction organic carbon accumulation in surface soil, but also improves soil C and N composition.

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