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黄土高原水蚀风蚀交错带不同立地条件下土壤呼吸特征

Soil respiration characteristics under different site conditions in wind-water crisscross erosion region on Loess Plateau

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中文关键词：土壤,温度,质地,土壤呼吸,立地条件,水蚀风蚀交错带,半干旱区

英文关键词:soils temperature textures soil respiration site conditions the wind and water erosion transitional belt semi-arid area

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中文摘要:

水蚀风蚀交错带是黄土高原土壤侵蚀最严重地区，该地区立地条件复杂，土壤质地有较大的空间变异性，对生态系统碳循环过程产生重要影响。该文选取土壤质地为立地条件的主要参考因子，利用便携式CO2分析仪对黄土高原水蚀风蚀交错带不同立地条件下2种典型灌木（柠条和沙柳）土壤呼吸特征进行了连续2a的野外对比研究，分析不同立地条件下灌木林地土壤呼吸之间的差异，阐明土壤呼吸的动态变化及其对土壤温度的敏感性。结果表明：在不同立地条件下，柠条林地黄绵土土壤呼吸高于风沙土，相反，沙柳林地风沙土土壤呼吸高于黄绵土。每种灌木林地在不同立地条件下土壤呼吸呈现明显的季节性变化，土壤呼吸速率的高峰值出现在7、8月份。不同立地条件下土壤呼吸与土壤温度呈现显著指数函数关系，每种灌木林地黄绵土土壤呼吸的温度敏感性系数Q10高于风沙土，从而对土壤温度的响应更为敏感。

英文摘要:

Abstract: The wind and water erosion transitional belt of the Loess Plateau experiences intensive soil erosion, where the site conditions are complicated. The spatial heterogeneity of soil texture can alter spatial heterogeneity of soil respiration, with a consequent impact on carbon cycling of the ecosystem. The objective of this study was to investigate the soil respiration characteristics of two dominant shrubs (Caragana Korshinkii and Salix psammophila) under different site conditions, and elucidate the temperature sensitivity of soil respiration in the wind and water erosion transitional belt of the Loess Plateau. Experiments were performed with two site conditions (silt loam soil and sandy soil) for each shrub during the growing seasons from 2009 to 2010. Soil respiration was measured every other day with an ultra-light portable photosynthesis system (CI-340, CID Inc., USA) fitting with a soil respiration chamber (CI-301SR). Soil temperature at a depth of 5 cm depth was measured using a digital thermometer (Omega HH509R, Stamford, CT) adjacent to each PVC collar. Soil moisture in the 0 - 6 cm soil layer was measured using a frequency domain reflectometry (FDR) with a hand-held push probe (Theta probe type ML2X, Delta-T, UK). The root biomass was estimated by the sequential core method. The results showed that the soil respiration of C. korshinkii was larger in silt loam soil than in sandy soil, unlike S. psammophila. Soil water content and soil temperature were significant abiotic factors mediating the response of soil respiration of C. korshinkii to site conditions, whereas biotic factors (root biomass) were an important factor that could regulate the response of S. psammophila to site conditions. Under different site conditions, soil respiration of each shrub showed obviously seasonal changes. The soil respiration of C. korshinkii achieved their peak values in July or August. The maximum soil respiration of Salix psammophila was observed in August. Soil temperature could better explain seasonal changes of soil respiration of C. korshinkii, whereas soil water content could better explain seasonal changes of soil respiration of Salix psammophila. The relationship between soil respiration and soil temperature was better expressed by an exponential function under different site conditions. The Q10 of soil respiration was larger in silt loam soil than in sandy soil. This showed that the soil respiration of silt loam soil was more sensitive to soil temperature.

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