松嫩平原西部草甸草原典型植物群落土壤呼吸动态及影响因素

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Soil respiration dynamics and its controlling factors of typical vegetation communities on meadow steppes in the western Songnen Plain.

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摘要
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摘要

以松嫩平原西部草甸草原中典型植物虎尾草、碱茅、芦苇和羊草群落为对象,分析了4种植被群落土壤呼吸速率日动态和季节动态及其影响因素,以及土壤盐碱度与土壤呼吸碳排放量的关系.结果表明: 4种植物群落的土壤呼吸速率日变化均呈明显的单峰曲线,峰值出现在11:00—15:00,而谷值大多出现在21:00—1:00或3:00—5:00; 4种植被群落土壤呼吸速率的季节变化趋势一致,7、8月的土壤呼吸速率(3.21~4.84 μmol $CO_2 \cdot m^{-2} \cdot s^{-1}$)最高,10月最低(0.46~1.51 μmol $CO_2 \cdot m^{-2} \cdot s^{-1}$); 各群落土壤呼吸速率与土壤和近地表大气温度之间呈极显著相关关系,其中,虎尾草群落的土壤呼吸速率与土壤表层含水量极显著相关,芦苇和羊草群落土壤呼吸速率与近地表的相对湿度显著相关.土壤盐分含量明显抑制了土壤CO_2排放量,土壤pH、电导率和土壤交换性钠可以解释该草甸草原土壤呼吸空间变异的 87%~91%.

关键词: 植被群落 土壤呼吸速率 CO_2 影响因子 松嫩平原草甸草原

Abstract:

In order to accurately explore the soil respiration dynamics and its controlling factors of typical vegetation types in the western Songnen Plain, soil respiration rates of *Chloris virgata*, *Puccinellia distans*, *Phragmites australis* and *Leymus chinensis* communities were measured. The results showed that the diurnal curves of soil respiration rates of the four vegetation communities had simple peak values, which appeared at 11:00-15:00, and the valley values occurred at 21:00-1:00 or 3:00-5:00. The seasonal dynamic patterns of their soil respiration rates were similar, with the maximum (3.21-4.84 μmol $CO_2 \cdot m^{-2} \cdot s^{-1}$) occurring in July and August and the minimum (0.46-1.51 μmol $CO_2 \cdot m^{-2} \cdot s^{-1}$) in October. The soil respiration rates of the four vegetation communities had significant exponential correlations with ambient air temperature and soil temperature. Soil moisture, however, only played an important role in affecting the soil respiration rate of *C. virgata* community while air humidity near the soil surface was significantly correlated with the soil respiration rates of *P. australis* and *L. chinensis* communities. The soil salt contents seriously constrained the CO_2 dioxide emission, and the soil pH, electrical conductivity (EC), exchangeable sodium percentage (ESP) could explain 87%-91% spatial variations of the soil respiration rate.

Key words: vegetation community soil respiration CO_2 controlling factor meadow steppes in Songnen Plain.

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